Commodity Hedging and Hedge Accounting along the industrial Supply Chain

Dr Tilman Huhne, d-fine GmbH

Lehrstuhl für Energiehandel und Finanzdienstleistungen
Universität Duisburg-Essen
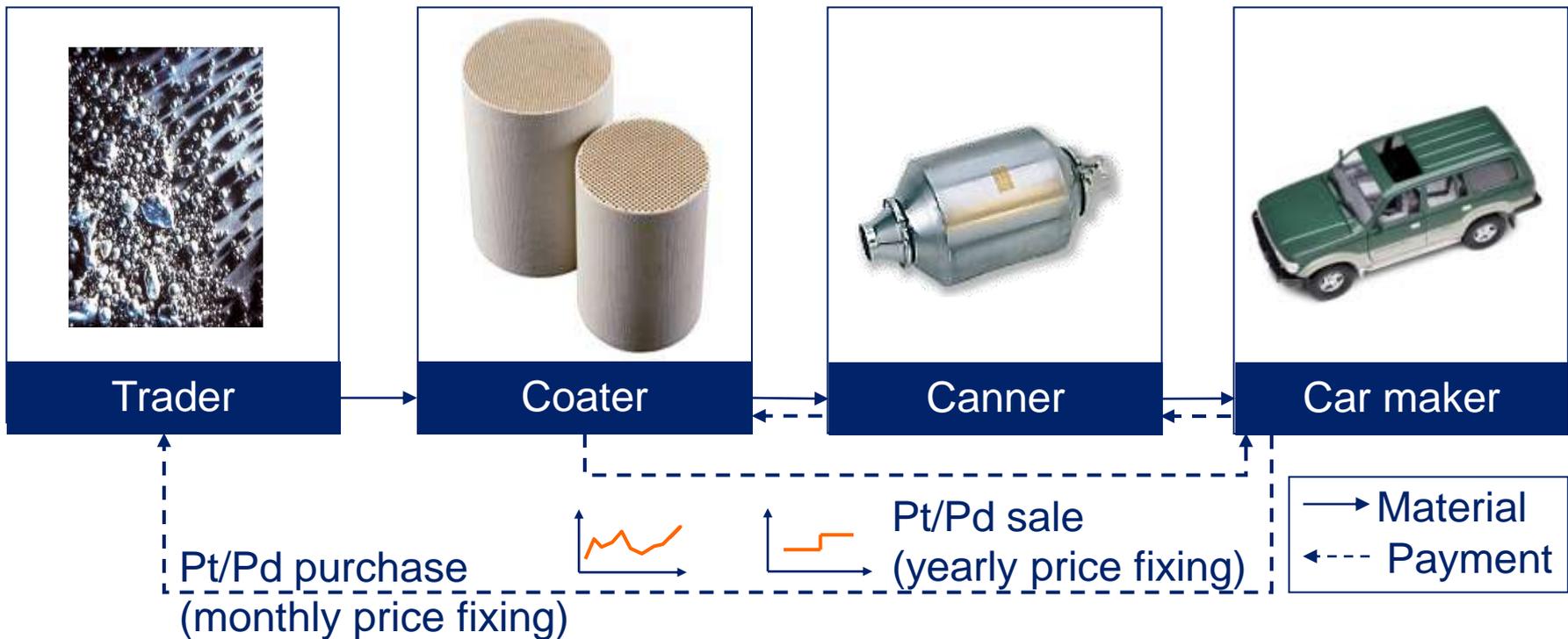
Essen, June 21, 2011

Agenda

- **Price risk exposure for physical commodities**

- Economic hedging along the industrial supply chain

- Accounting treatment of economic hedging schemes (IFRS)

- Commodity hedge accounting framework (IFRS)

- Case study – commodity hedging and hedge accounting

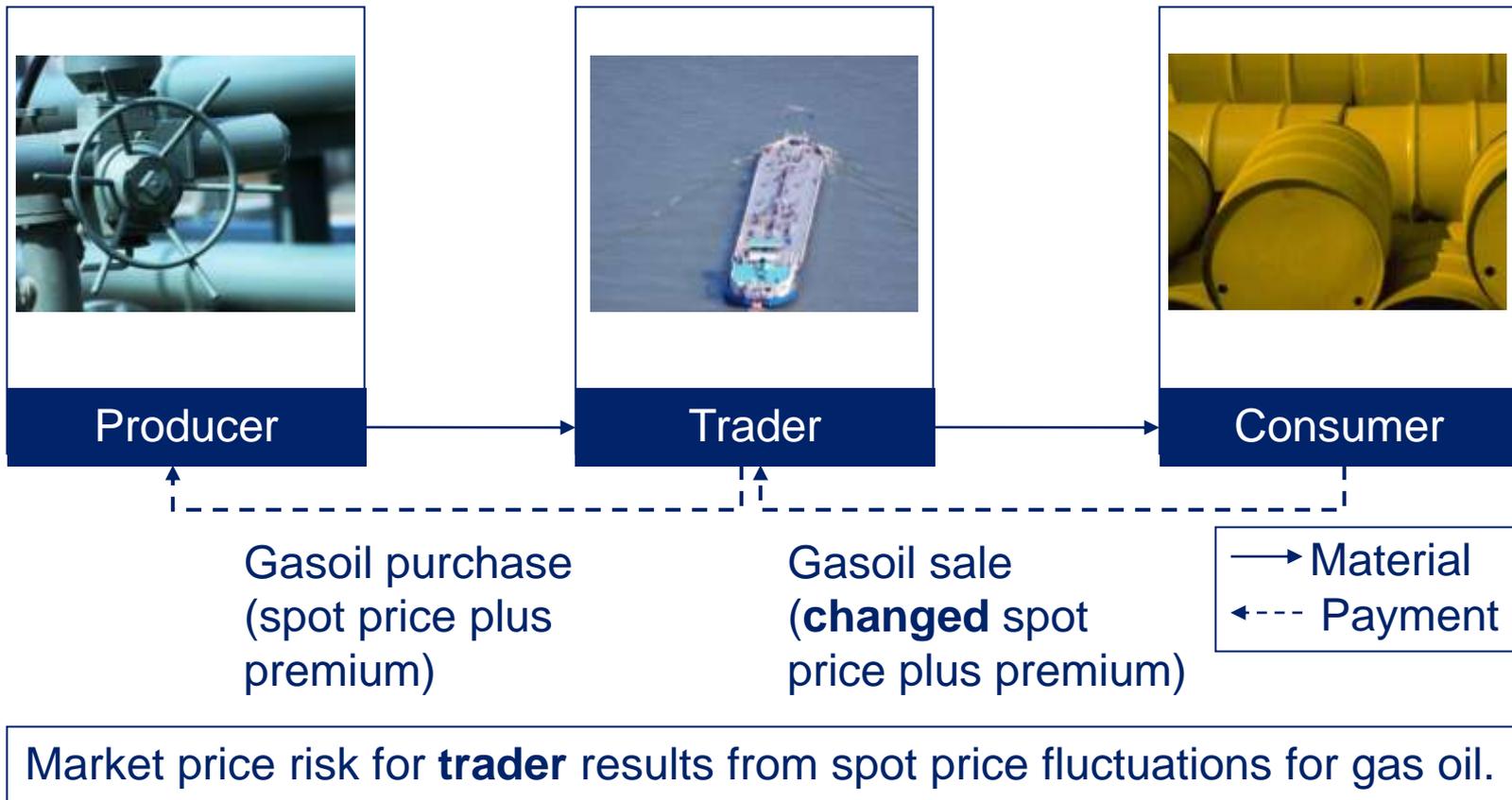- Summary

Price risk exposure for physical commodities

Purchase of precious metals for production of exhaust gas systems
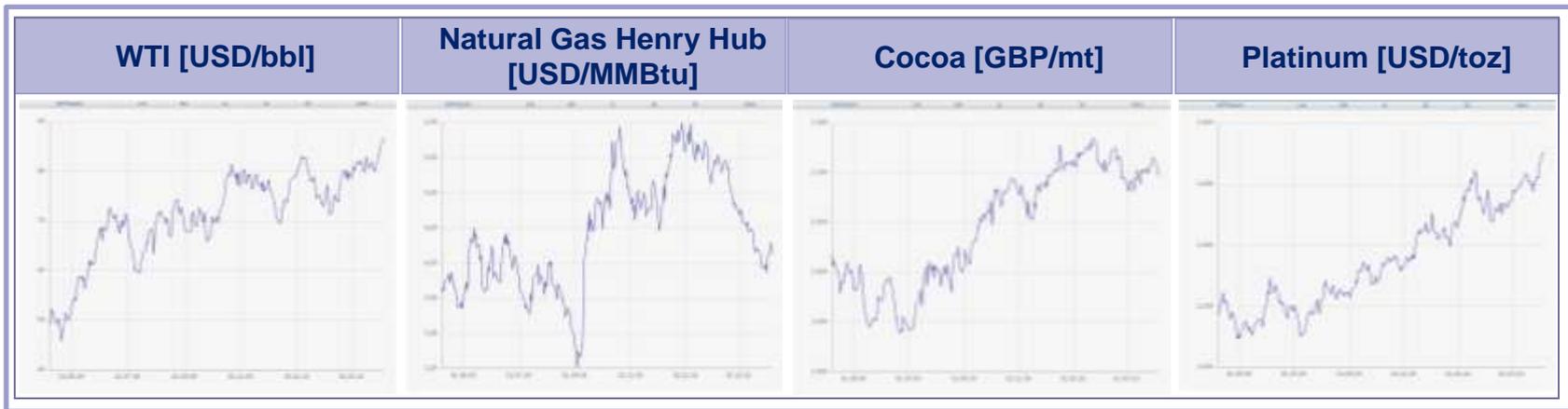

| Trader | Coater | Canner | Car maker |

Pt/Pd sale
(yearly price fixing)

Pt/Pd purchase
(monthly price fixing)

→ Material
←--- Payment

Market price risk for **car maker** results from monthly price fluctuations for Pt/Pd.

Price risk exposure for physical commodities (II)

Gasoil trading

| Producer | Trader | Consumer |

Gasoil purchase (spot price plus premium)

Gasoil sale (**changed** spot price plus premium)

→ Material
◄--- Payment

Market price risk for **trader** results from spot price fluctuations for gas oil.

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Commodity price volatility and its impact

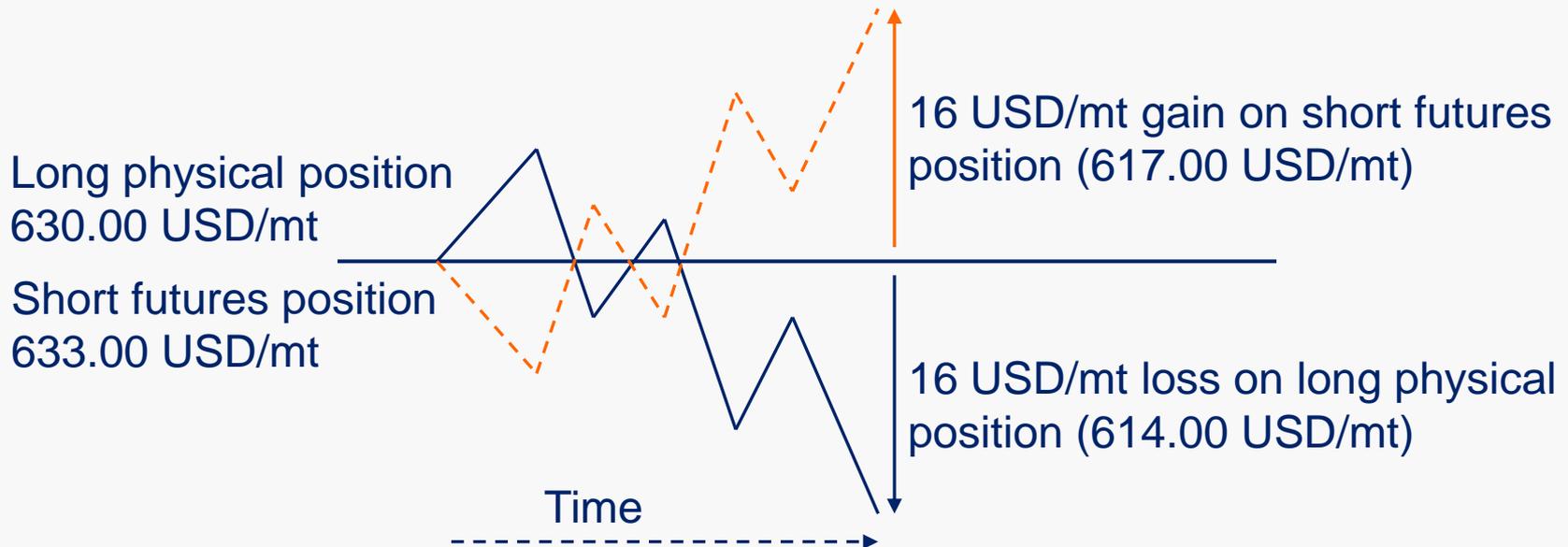| WTI [USD/bbl]	Natural Gas Henry Hub [USD/MMBtu]	Cocoa [GBP/mt]	Platinum [USD/toz]

- Large historic price volatility for commodities leads to fluctuating costs and earnings for industrial companies and energy firms
- Economic hedging of energy and commodity inventories, firm commitments and forecast transactions using derivatives can be applied to mitigate risks and control and stabilize costs and earnings

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Example: Hedge of gasoil inventory using futures

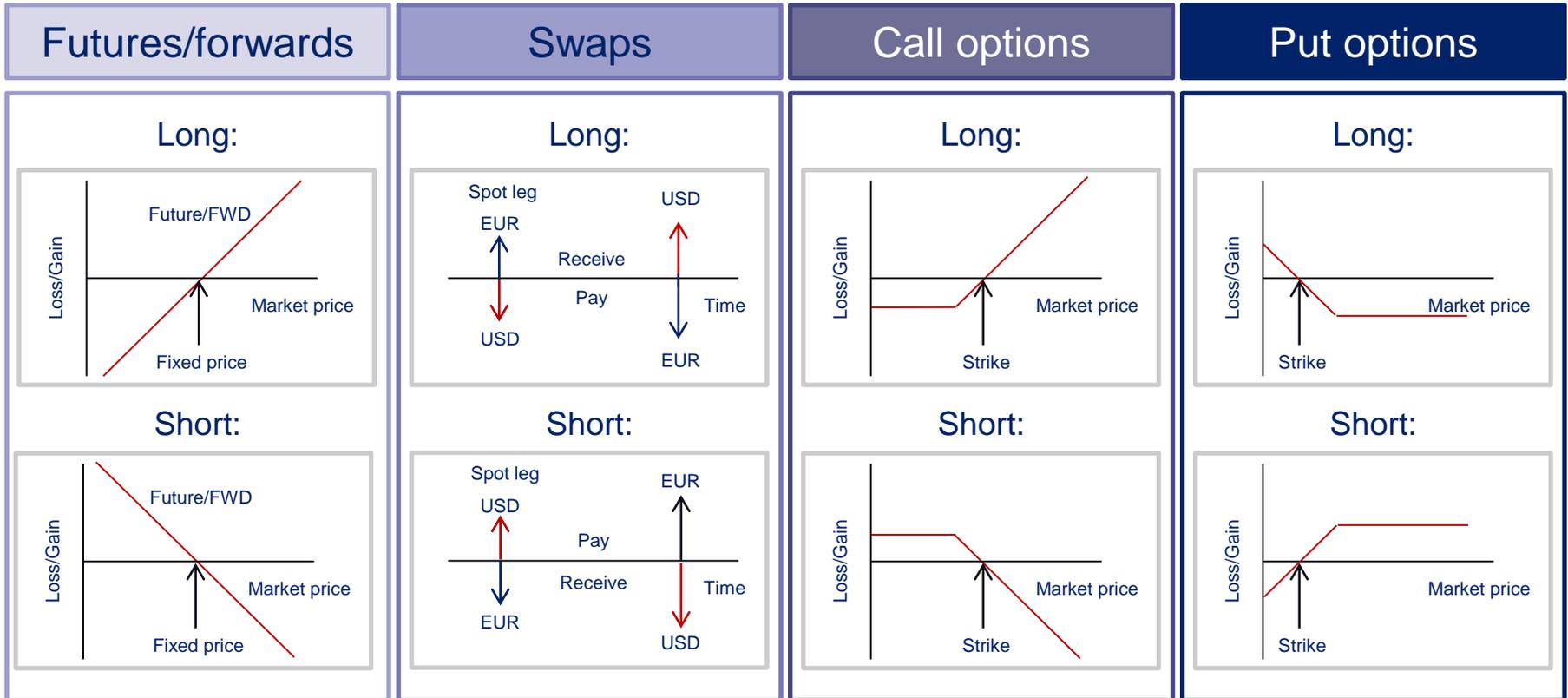- Physical purchase of gasoil ($630.00/mt) leads to a long position in gasoil
- To hedge the physical long position, the owner takes an offsetting short position in gasoil futures ($633.00/mt for delivery in one month)

Long physical position
630.00 USD/mt

Short futures position
633.00 USD/mt

16 USD/mt gain on short futures position (617.00 USD/mt)

16 USD/mt loss on long physical position (614.00 USD/mt)

Time

Overview – commodity derivatives markets

Exchange traded		Over the Counter (OTC)	
Advantages	**Disadvantages**	**Advantages**	**Disadvantages**
• Price transparency • Trading liquidity due to standardization • Counterparty risk reduction due to central clearing and netting/margining • Standardized MO/BO processes	• Highly standardized contracts can lead to a residual risk position ("basis risk") • Additional funding for cash collateral • Implementation of advanced liquidity risk management concepts and processes	• Tailor-made derivatives to fully eliminate full economic risk position • Flexible collateralization schemes • Tailoring to existing organization, systems and processes	• Valuation / pricing might be difficult (especially for complex contracts) • Active counterparty risk management necessary • Legal risks e.g. regarding netting agreements

Overview – hedging derivatives

Futures/forwards	Swaps	Call options	Put options

Long:

Futures/forwards — Long: Future/FWD, Loss/Gain vs Market price, Fixed price

Swaps — Long: Spot leg, EUR, USD, Receive, Pay, Time, USD, EUR

Call options — Long: Loss/Gain vs Market price, Strike

Put options — Long: Loss/Gain vs Market price, Strike

Short:

Futures/forwards — Short: Future/FWD, Loss/Gain vs Market price, Fixed price

Swaps — Short: Spot leg, USD, EUR, Pay, Receive, Time, EUR, USD

Call options — Short: Loss/Gain vs Market price, Strike

Put options — Short: Loss/Gain vs Market price, Strike

Hedging – basic strategies and **economic PnL**

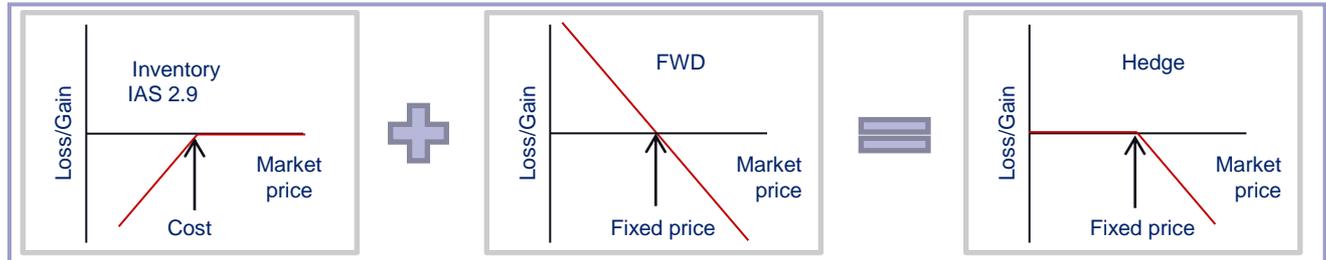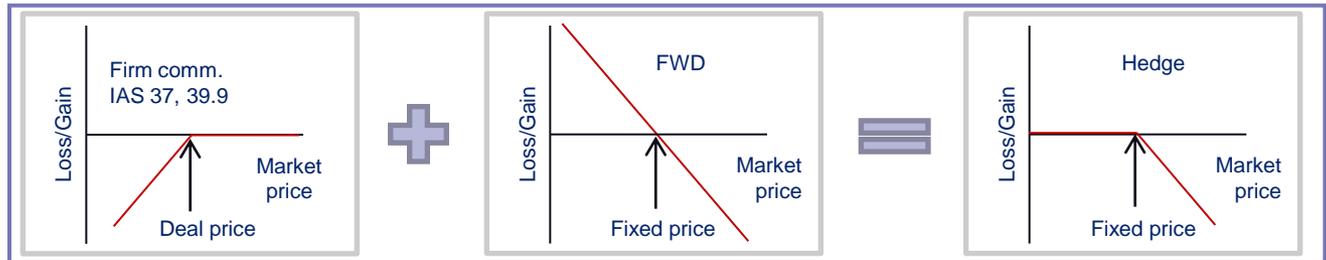|			
Hedge of inventory	Inventory — Loss/Gain vs Market price, Cost	➕ FWD — Loss/Gain vs Market price, Fixed price	🟰 Hedge — Loss/Gain vs Market price, Fixed price
Hedge of firm commitment	Firm comm. — Loss/Gain vs Market price, Deal price	➕ FWD — Loss/Gain vs Market price, Fixed price	🟰 Hedge — Loss/Gain vs Market price, Fixed price
Hedge of forecast sales	Forecast sales — Loss/Gain vs Market price, Deal price	➕ FWD — Loss/Gain vs Market price, Fixed price	🟰 Hedge — Loss/Gain vs Market price, Fixed price
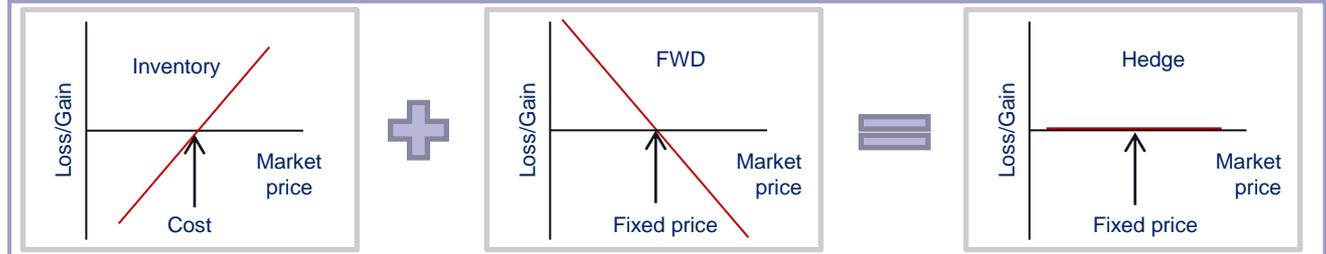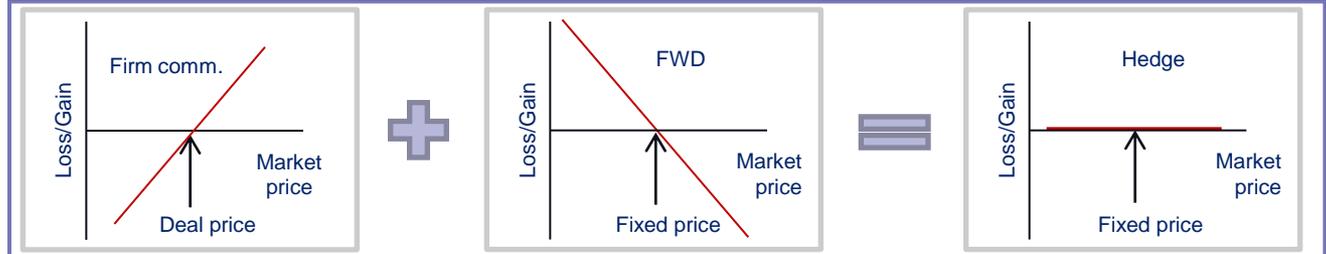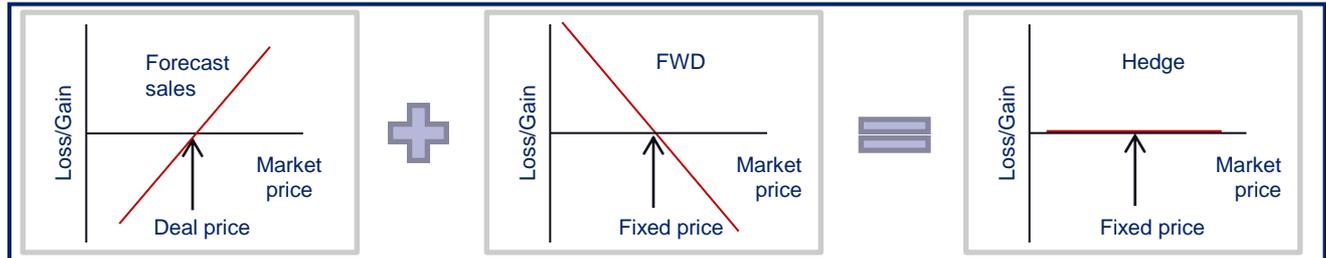
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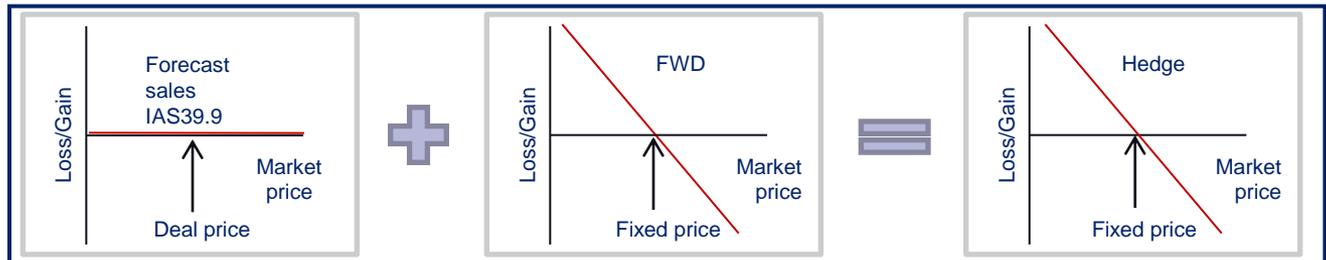# Hedging – basic strategies and **accounting-PnL (IFRS)**

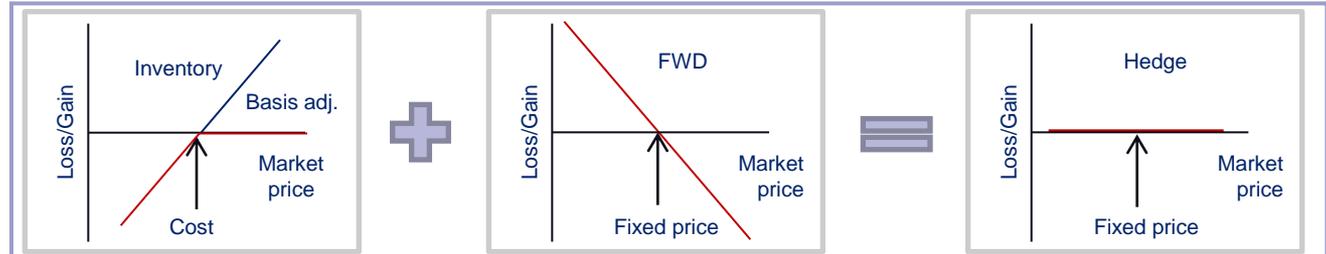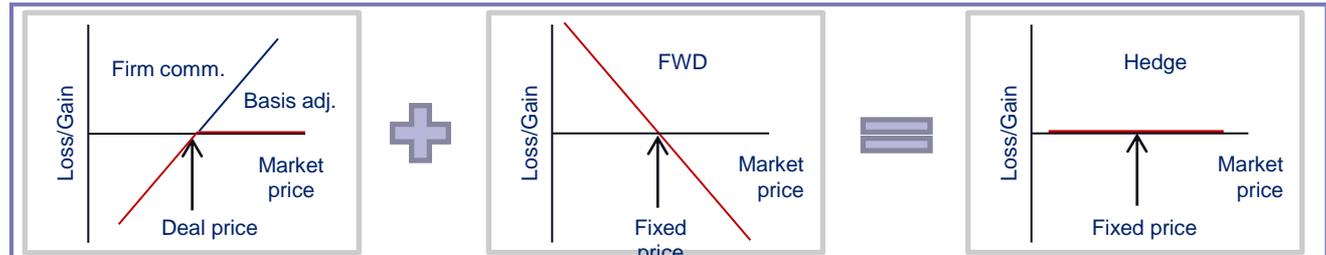|			
Hedge of inventory	Inventory IAS 2.9 (Loss/Gain vs Market price, Cost)	+ FWD (Loss/Gain vs Market price, Fixed price)	= Hedge (Loss/Gain vs Market price, Fixed price)
Hedge of firm commitment	Firm comm. IAS 37, 39.9 (Loss/Gain vs Market price, Deal price)	+ FWD (Loss/Gain vs Market price, Fixed price)	= Hedge (Loss/Gain vs Market price, Fixed price)
Hedge of forecast sales	Forecast sales IAS39.9 (Loss/Gain vs Market price, Deal price)	+ FWD (Loss/Gain vs Market price, Fixed price)	= Hedge (Loss/Gain vs Market price, Fixed price)

No application of hedge accounting

IFRS Mixed Model: Non-economic PnL volatility due to asymmetric measurement

Hedging – basic strategies and **accounting-PnL (IFRS)**

Application of hedge accounting
Non-economic PnL volatility compensated

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Hedge types and hedged items (IFRS)

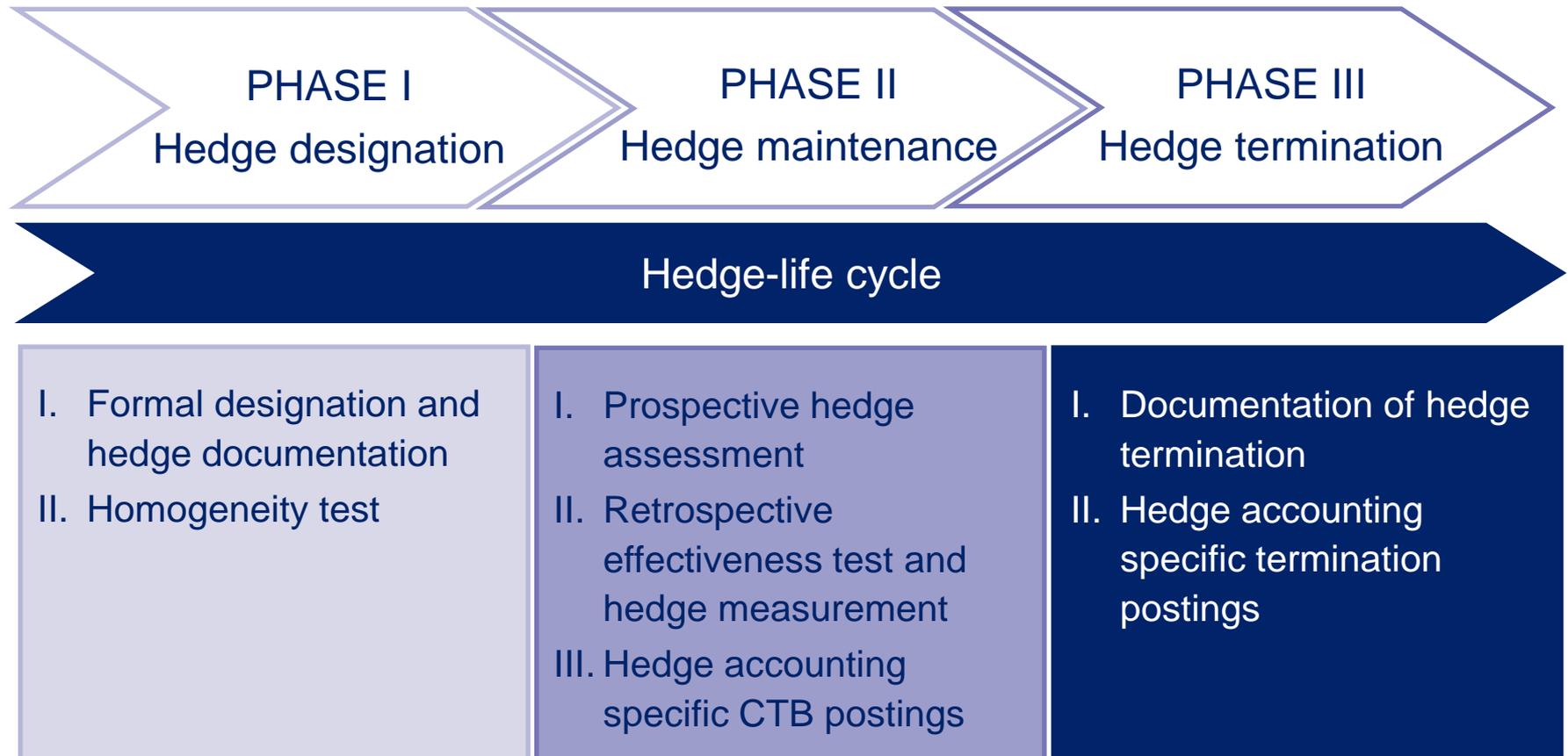| Fair Value Hedge	Cash Flow Hedge	Hedge of Net Investment
Objective:	**Objective:**	**Objective:**
• Hedging the fair value/market value risk of the underlying	• Hedging the risk of cash flow volatility of the underlying	• Hedging the FX risk of a net investment in a foreign operation
Hedged item IAS39.86(a)	**Hedged item IAS39.86(b)**	**Hedged item IAS39.86(c)**
• B/S positions, financial and non-financial assets or liabilities	• Future cash in- and out-flows of B/S positions, financial and non-financial assets or liabilities	• IAS21 hedge of net investment in a foreign entity
• Firm commitments	• **Highly probable forecast transactions**	• Equity volatility reduction related to an FX net investment (similar to cash flow hedges)
	• Firm commitments (FX risk)	

Hedge accounting process – phases and tasks

PHASE I	PHASE II	PHASE III
Hedge designation	Hedge maintenance	Hedge termination

Hedge-life cycle

I. Formal designation and hedge documentation II. Homogeneity test	I. Prospective hedge assessment II. Retrospective effectiveness test and hedge measurement III. Hedge accounting specific CTB postings	I. Documentation of hedge termination II. Hedge accounting specific termination postings

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Designation phase – general overview

Hedging instruments	Designation of hedge relations	Hedged items
• Derivatives • For foreign currency risk: Non-derivative financial assets or non-derivative financial liabilities	**Objective:** • Elimination of non-economic PnL **Requirements:** • Documentation • Effectiveness measurements	• B/S assets or liabilities • Firm commitments • **Forecast transactions** • Net investment in a foreign entity

Hedge types

Fair Value Hedge	Cash Flow Hedge	Hedge of Net Investment
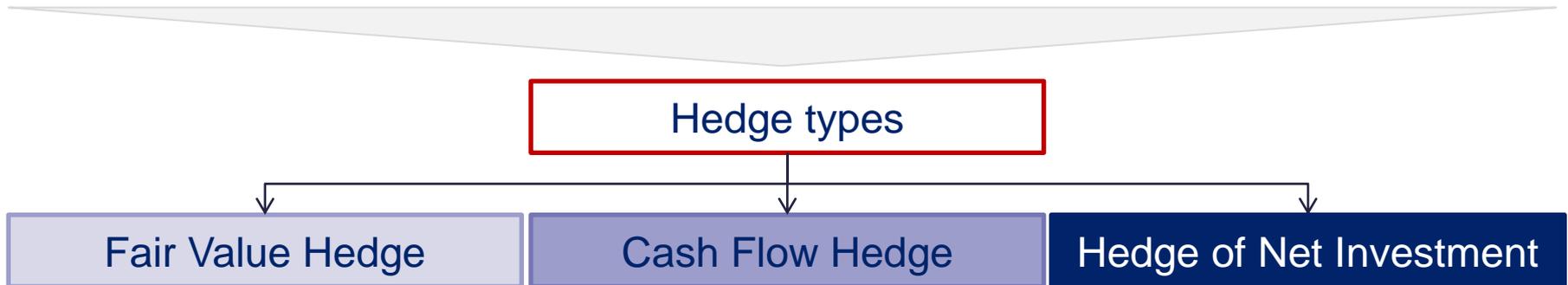
Hedge relations – classifications based on hedged item

Micro hedge	Portfolio hedge
Hedged item:	**Hedged item:**
• Single asset, e.g. share, FX loan	• IAS39.83 portfolio/group of similar assets or similar liabilities where the individual assets or individual liabilities share the risk exposure that is designated as being hedged
• Single liability, e.g. bond issue	
• Single firm commitment, e.g. commodity procurement or sales contract	
• **Single forecast transaction, e.g. commodity procurement or sales contract**	• Changes in fair value for each individual item in the group is approximately proportional to the overall change in fair value attributable to the hedged risk of the group of items
	• Portfolio homogeneity test for every reporting period required (except IR portfolio hedge)

Hedged risks – designation rules

Financial instrument IAS39.81,81(a)	Non-financial item IAS39.82
Hedged risk of the hedged item:	**Hedged risk of the hedged item:**
• Overall hedge: Complete changes in fair value or cash flows	• Overall hedge: Complete changes in fair value or cash flows
• Portion hedge: Percentage of changes in fair value or cash flows	• Portion hedge: Percentage of changes in fair value or cash flows
• Component / term hedge: Changes in fair value or cash flows related to selected contractual cash flows (benchmark or risk free interest rate, FX risk)	• Foreign currency risk
	• **No component hedge allowed due the difficulty of isolating and measuring the appropriate portion of the cash flows or fair value changes attributable to specific risks other than FX**

Hedging instruments – qualification

Qualifying instruments	Non-qualifying instruments
• In general derivative contracts (IAS39.72) • Non-derivative financial assets or non-derivative financial liabilities may be designated as hedging instrument only for a hedge of foreign currency risk (IAS39.72)	• (Net) written options, e.g. collars (IAS39.72) • Internal (derivative) instruments with no one-to-one correspondence to external transactions (IAS39.73) • Derivatives whose fair value cannot be reliably measured (IAS39.AG96) • Entity's own equity instruments (IAS39.AG97) • Concurrent offsetting swaps, i.e. back-to-back deals with the same counterparty (IAS39.IG F.1.14)

Hedging instruments – designation rules

General principle
Hedging derivative instruments are measured at full fair value, i.e. no splitting of compounds

Options IAS39.74(a), IAS39.IG.F.1.10	Exemption (optional use)	Forwards IAS39.74(b), IAS39.IG.F.1.10

Fair value of option can be split into time value and intrinsic value		Fair value of forward can be split into „IR" component and remainder

Only the intrinsic value is designated, whereas the time value is classified as HfT		Only the remainder is designated, whereas the IR component is classified as HfT

Hedge accounting process – phases and tasks

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I. Formal designation and hedge documentation
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PHASE II
I. Prospective hedge assessment
II. Retrospective effectiveness test and hedge measurement
III. Hedge accounting specific CTB postings

PHASE III
I. Documentation of hedge termination
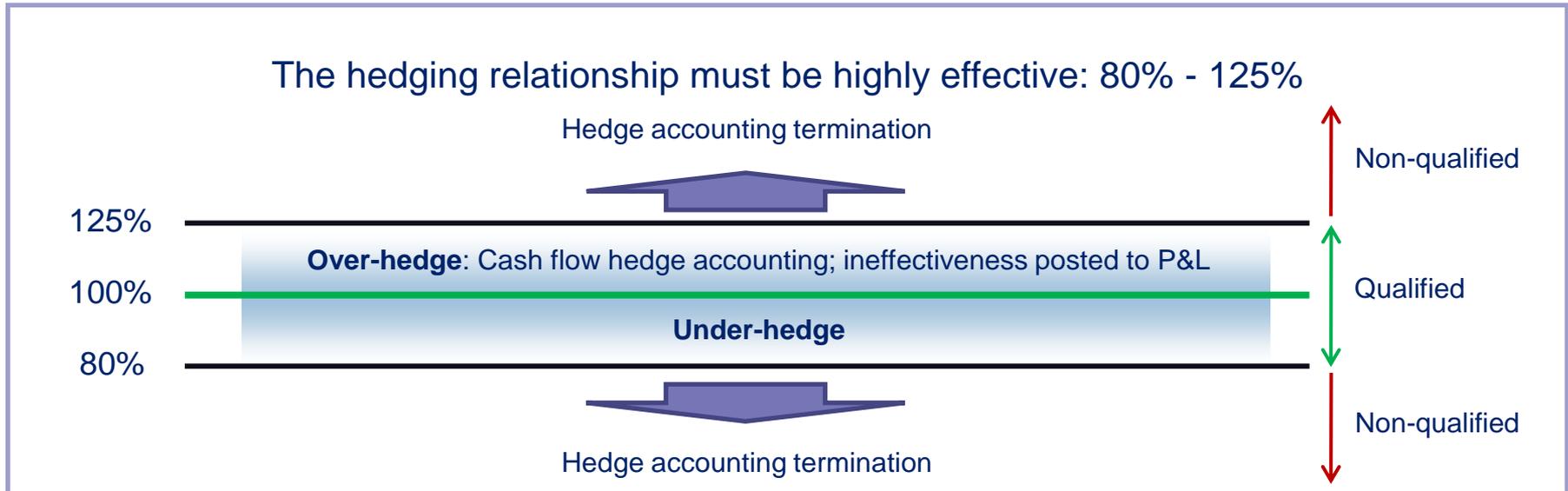II. Hedge accounting specific termination postings

Hedge maintenance phase – general overview

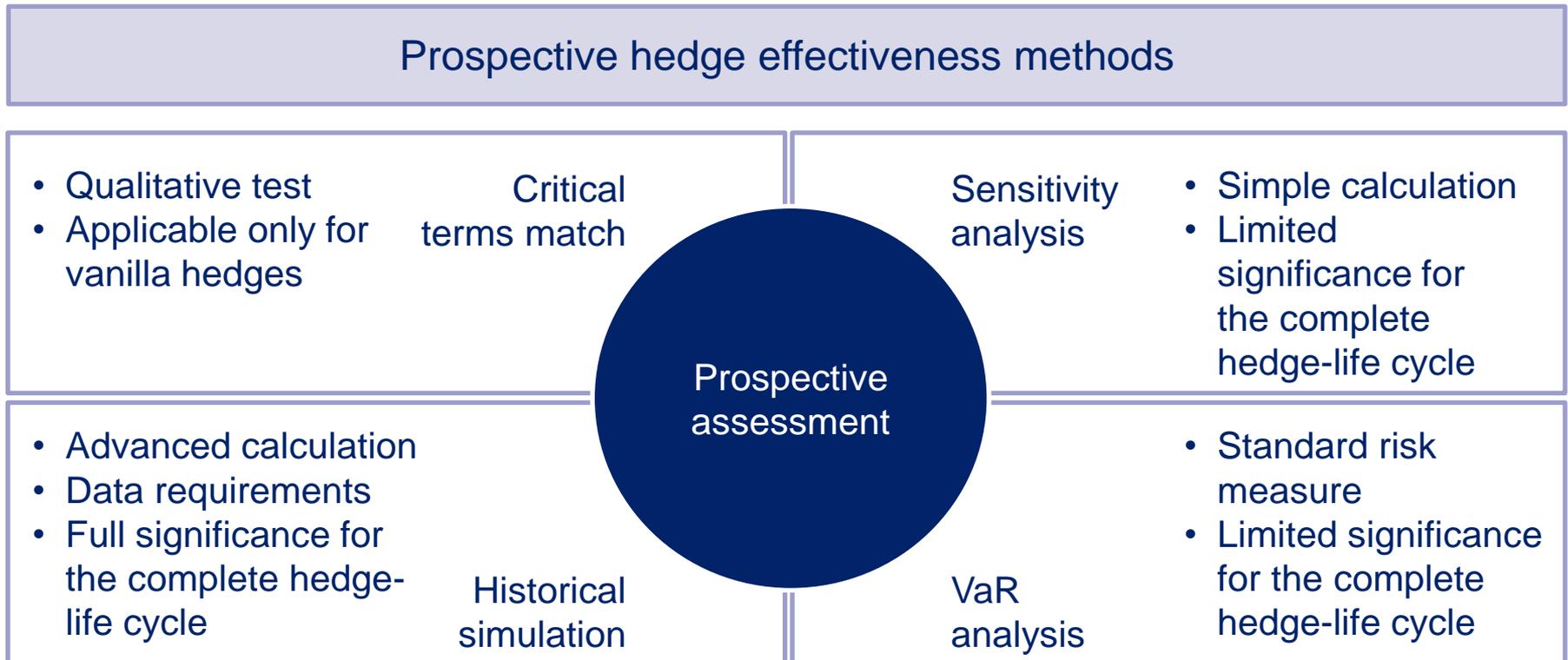| Prospective effectiveness test	Retrospective effectiveness test	Regular CtB postings
• The hedge is expected to be highly effective in achieving offsetting changes in fair value or cash flows attributable to the hedged risk, IAS39.88(b) and IAS39.AG105-AG113.	• The hedge is assessed on an ongoing basis and determined to actually have been highly effective throughout the financial reporting periods for which the hedge was designated, IAS39.88(e).	• FVH – basis adjustment for carrying amount if hedged item is measured at cost, IAS39.89(b) • FVH – OCI reclassification to profit and loss if hedged item is "available for sale", IAS39.89(b) • **CFH – changes in fair value of the hedging instrument are recognized in OCI (not in profit and loss)**

Hedge effectiveness – general requirements

Hedge effectiveness:

The degree to which changes in the fair value or cash flows of the hedged item that are attributable to a hedged risk are offset by changes in the fair value or cash flows of the hedging instrument

The hedging relationship must be highly effective: 80% - 125%

Hedge accounting termination

Non-qualified

125%

Over-hedge: Cash flow hedge accounting; ineffectiveness posted to P&L

100%   Qualified

Under-hedge

80%

Non-qualified

Hedge accounting termination

Ex-ante hedge effectiveness

Prospective hedge effectiveness methods

- Qualitative test
- Applicable only for vanilla hedges

Critical terms match

Prospective assessment

Sensitivity analysis

- Simple calculation
- Limited significance for the complete hedge-life cycle

- Advanced calculation
- Data requirements
- Full significance for the complete hedge-life cycle

Historical simulation

VaR analysis

- Standard risk measure
- Limited significance for the complete hedge-life cycle

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Ex post hedge effectiveness

Retrospective hedge effectiveness methods

Short cut	Dollar offset
• Inappropriate according to IAS39.IG.F.4 (US GAAP only)	• Simple calculation • Periodic vs. cumulative approach • „Small number" problem

Retrospective assessment

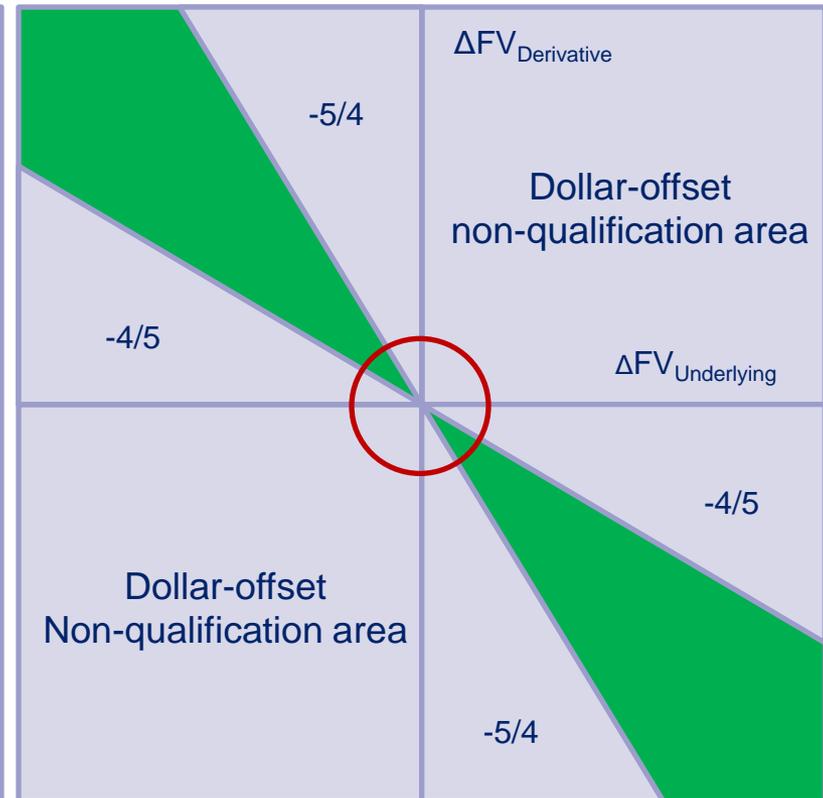| Variance reduction	Regression analysis
• Advanced calculation • Qualified despite sporadic outliers • Minimum number of data points needed	• Advanced calculation • Qualified despite sporadic outliers • Minimum number of data points needed

Retrospective HE – Dollar-offset

Standard Dollar-offset

- Hedge key figures are in general changes in „market value" (fair value)

- Hedge effectiveness

$$\varepsilon = \frac{\Delta FV_{Derivative}}{\Delta FV_{Underlying}}$$

- Periodic (cumulative) assessment is based on changes in hedge key figures of the current reporting period (since hedge inception)

- If changes in hedge key figures are small, hedge is considered non-qualified

$\Delta FV_{Derivative}$

-5/4

Dollar-offset non-qualification area

-4/5

$\Delta FV_{Underlying}$

-4/5

Dollar-offset Non-qualification area

-5/4

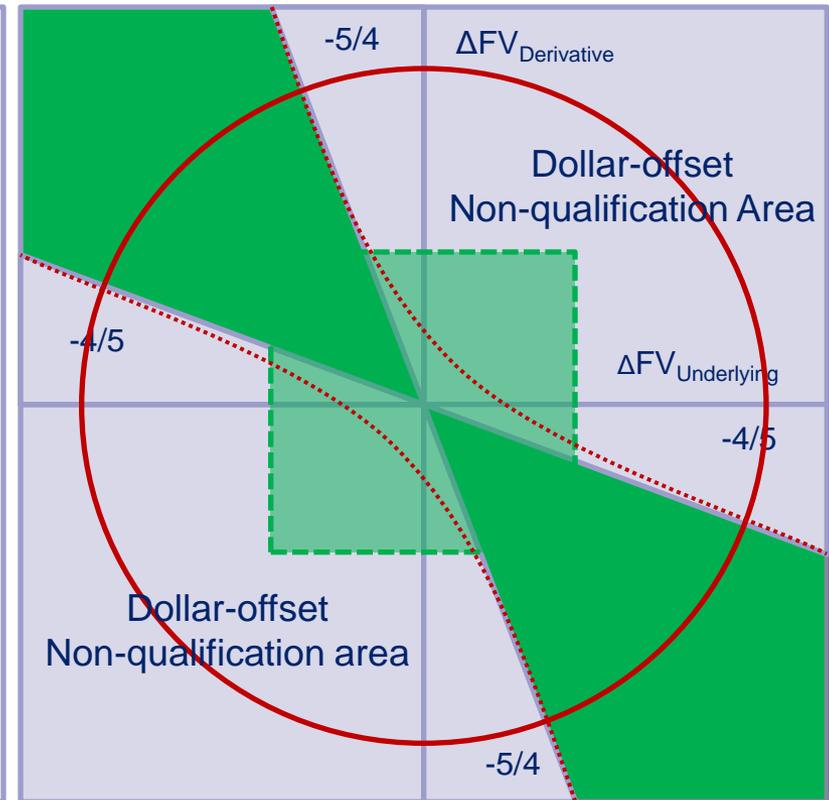# Retrospective HE – modified Dollar-offset

Modified Dollar-offset

- Resolution of "small number problem"

- Static thresholds

  a) Nominal, i.e. qualified hedge if hedge key figure changes smaller USD 10.000

  b) Percentage, i.e. qualified hedge if hedge key figure changes smaller Nominal x 5‰

- Dynamic thresholds

$$\varepsilon = \frac{\Delta FV_D \cdot \left(\dfrac{\sqrt{\Delta FV_D{}^2 + \Delta FV_U{}^2}}{n \cdot N}\right)^s + \Theta(\Delta FV_D) \cdot n \cdot N}{\Delta FV_U \cdot \left(\dfrac{\sqrt{\Delta FV_D{}^2 + \Delta FV_U{}^2}}{n \cdot N}\right)^s - \Theta(\Delta FV_D) \cdot n \cdot N}$$

$\Theta(x) = +1$, if $x > 0$, otherwise $\Theta(x) = -1$;
N = Nominal, n = Noise-Term = 1%, s = speed = 1/2

-5/4 $\Delta FV_{Derivative}$

Dollar-offset
Non-qualification Area

-4/5 $\Delta FV_{Underlying}$

-4/5

Dollar-offset
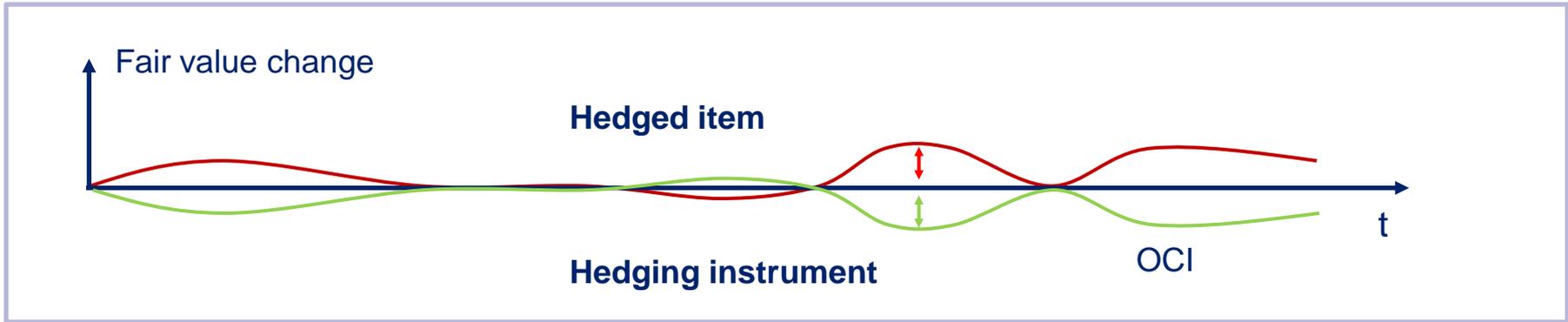Non-qualification area

-5/4

Retrospective HE – regression analysis

Regression analysis

- Hedge key figures are in general changes in „market value" (full fair value)

- Data points based on periodic changes in hedge key figures

- Requirements:
  - Minimum of 25 data points
  - Slope β_1 of the regression line within [-5/4;-4/5]
  - Intercept β_0 smaller than nominal x 5‰
  - Regression coefficient $R^2 \geqq 0,8$

- t-/F-test passed with 95% confidence

-5/4

$\Delta FV_{Derivative}$

-4/5

$\Delta FV_{Underlying}$

-4/5

-5/4
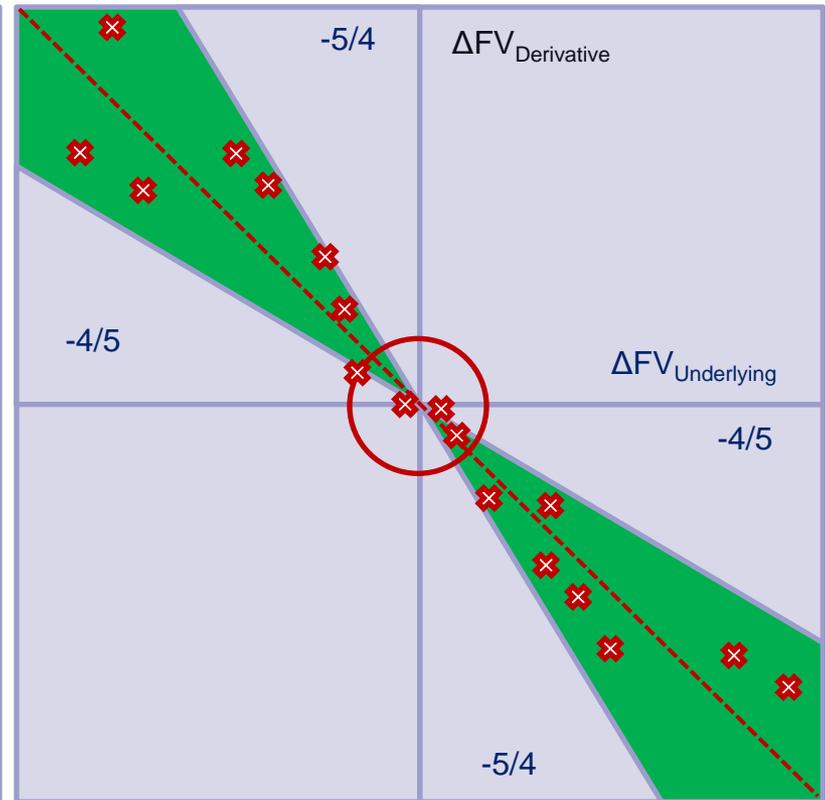
Regular CtB hedge accounting postings (CF HA)

Fair value change

Hedged item

Hedging instrument

OCI

t

Hedging instrument:

For qualified hedges full fair value changes are split into a effective and in-effective component
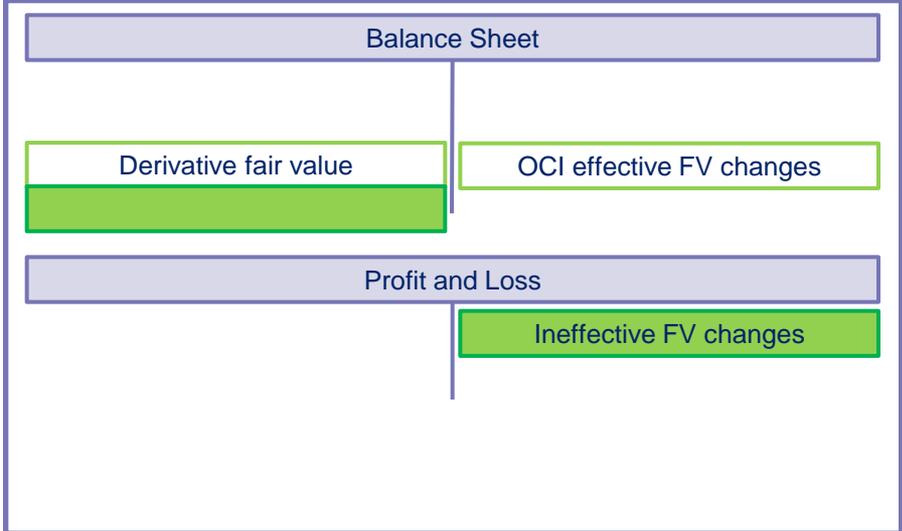
Hedged item:

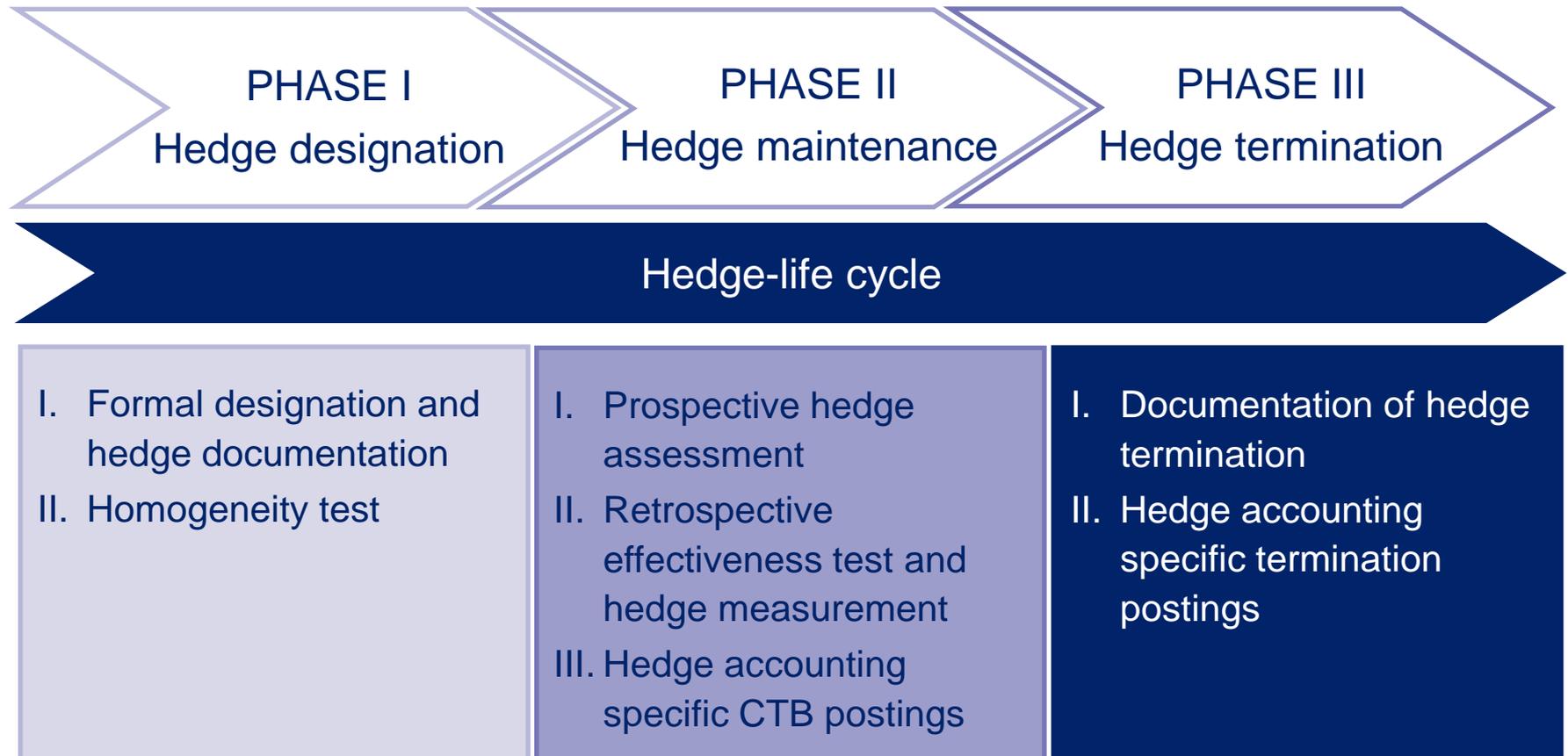Hedged item is posted according to basic rules

B/S impact:
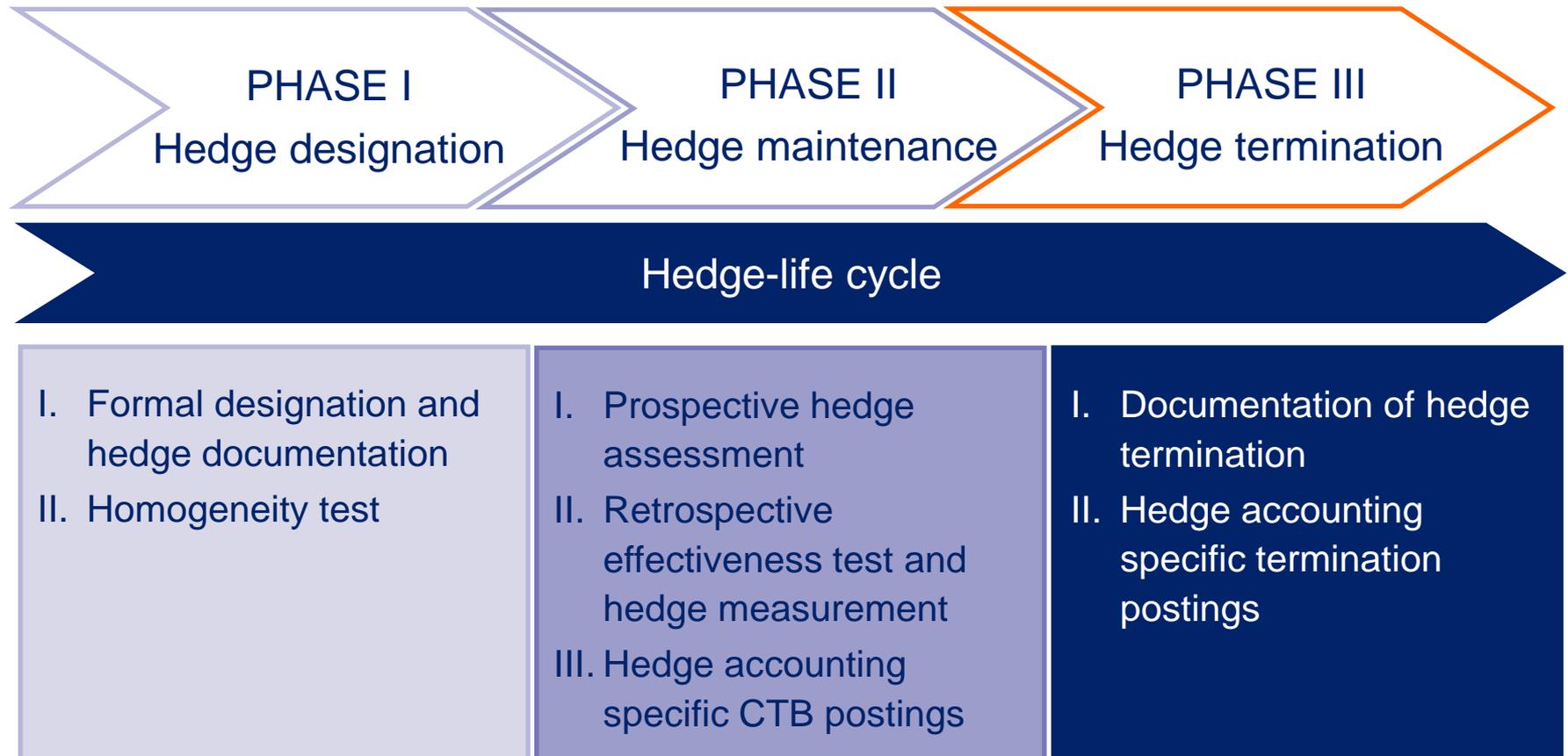
Effective portion is recognized in equity (OCI)

P&L impact:

Ineffectiveness (over-hedge)

Balance Sheet	
Derivative fair value	OCI effective FV changes

Profit and Loss	
	Ineffective FV changes

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Hedge accounting process – phases and tasks

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Termination phase – events

| Regular	Irregular	Management decision

• De-recognition, i.e. expiry or sale, termination or exercise of hedging instrument
  • FVH – IAS 39.91(a)
  • CFH – IAS 39.101(a)
	• Non-qualification:
	  – FVH – IAS 39.91(b)
	  – CFH – IAS 39.101(b)
	• Exposure reduction, i.e. forecast transaction is no longer expected to occur, IAS 39.101(c)
		• Revocation, i.e. entity revokes hedge designation by management decision
		  • FVH – IAS 39.91(c).
		  • CFH – IAS 39.101(d).

Accounting impact

Amortization	Re-classification	Discharge

Cash flow hedge termination

Balance sheet

| ΔFair value - effective | OCI = - ΔFV – effect. |

Derivative fair value
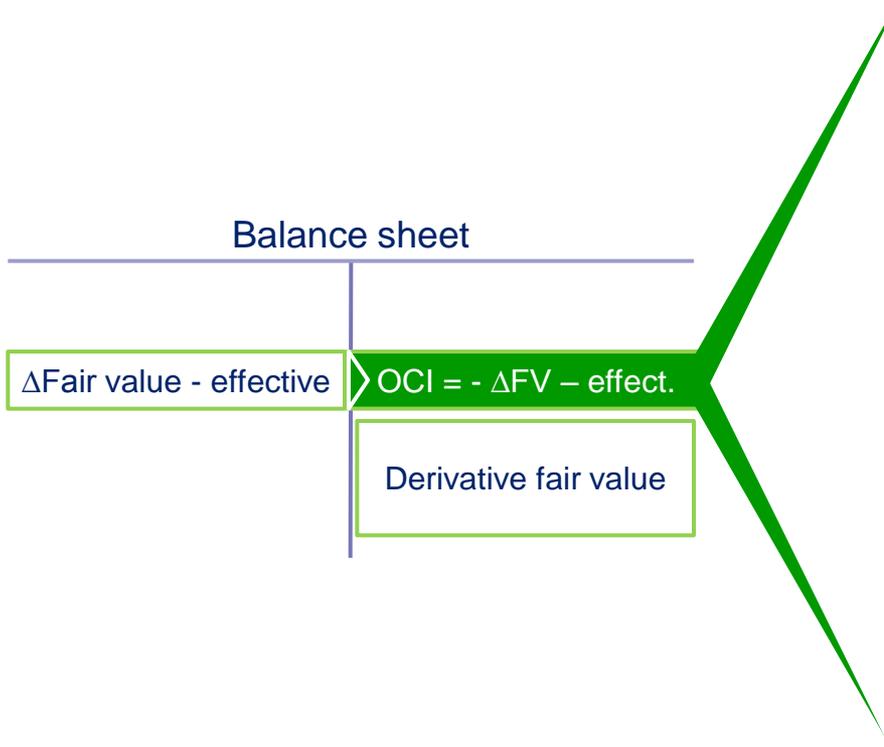
OCI discharge

- The cumulative gain or loss on the hedging instrument recognized in other comprehensive income from the period when the hedge was effective shall be discharged immediately from equity to profit and loss

OCI reclasssification

- Amounts recognized in OCI are reclassified from equity to profit or loss in the same period or periods during which the underlying affects profit or loss, IAS39.97, 98(a),100
- OCI reclassification modifies the initial cost or other carrying amount of the non-financial asset /liability, IAS39.98(b)

Termination postings

Accounting impact depends on hedge type and termination event

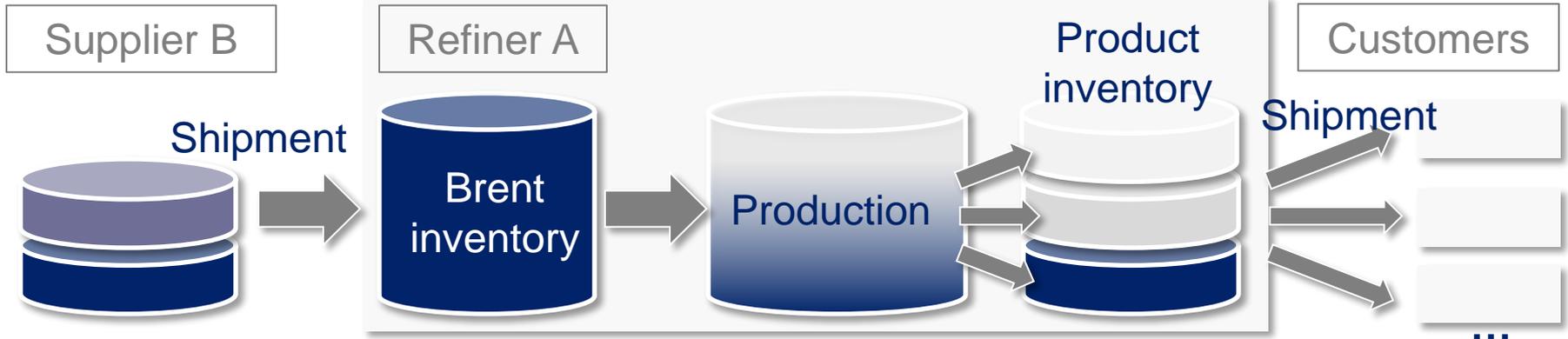| Termination event	Fair Value Hedge	Cash Flow Hedge
1 De-recognition of hedged item	De-recognition of basis adjustment line item vs. PnL	Discharge of cumulative OCI to PnL/basis adjustment (BA)
2 De-recognition of hedging instrument	Amortization of basis adjustment according to hedged item	OCI-freeze and subsequent reclassification to PnL/BA
3 Non-qualification	Amortization of basis adjustment according to hedged item	OCI-freeze and subsequent reclassification to PnL/BA
4 Exposure reduction	—	Discharge of cumulative OCI to PnL
5 Not (highly) probable forecast transactions	—	OCI-freeze and subsequent reclassification to PnL/BA.

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CS: Oil refinery – procurement and sales

| Economic background | • Company A (refiner) has to purchase **crude oil** on a regular basis to serve its production needs
• From its current production and inventory planning, A anticipates a need of 70,000 bbl of **Brent** in 6 months time from today to produce an equivalent output (gasoil etc.) |

Physical supply chain (simplified)

Supplier B   Refiner A   Product inventory   Customers

Shipment → Brent inventory → Production → Product inventory → Shipment → ...

CS: Oil refinery – procurement and sales (II)

Economic hedging strategy

- A expects rising crude oil prices, but relatively stable product prices for the coming months
- In order to support its refinery margins, A has the possibility to effectively fix the price for a delivery of 50,000 bbl of Brent in 6 months time from today
- Alternatively, A may directly secure its refinery margin for an equivalent of 50,000 bbl of Brent in 6 months time
- Both strategies can be achieved by different economic hedging schemes based on derivatives
- Hedge accounting can be flexibly applied to a variety of economic hedging schemes given the related requirements are fulfilled

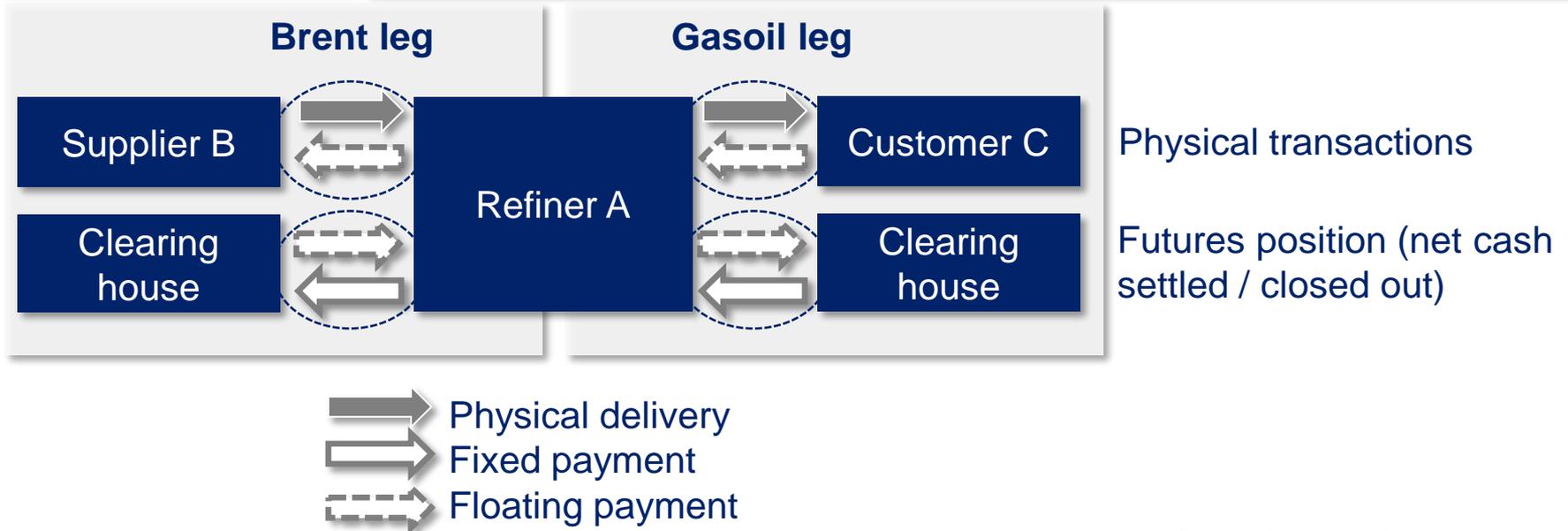# CS: Hedge of crack spread using futures contracts

Hedging scheme

- Refiner A takes a long position in gasoil crack spread using futures (i.e. purchase of crude oil, sales of the equivalent amount of gasoil produced)
- ***Example*: ICE Gasoil Futures Crack***
  - ***Brent leg:*** long position of 30,000 bbl or approx. 4,000 metric tonnes (30 lots); net cash settlement
  - ***gasoil leg:*** short position of 4,000 metric tonnes (40 lots); physical delivery, closed out before expiry
  - Crack spread locked in: 10 USD / bbl
  - Due to the characteristics of the Brent and gasoil futures, the Brent leg expires earlier than the gasoil leg

*Alternatively, separate long (short) positions in Brent (gasoil) can be taken.

CS: Hedge of crack spread using futures contracts (II)

Hedging scheme (II)

- Refiner A arranges with its **supplier B** for the delivery of 30,000 bbl of **Brent** in 6 months time from today on a floating price basis which refers to the Brent future's settlement price at expiry
- Refiner A arranges with its **customer C** for the delivery of 4,000 mt of **gasoil** in 8 months time on a floating price basis which refers to the gasoil future's settlement price at expiry

Brent leg   **Gasoil leg**

Supplier B   Customer C   Physical transactions

Refiner A

Clearing house   Clearing house   Futures position (net cash settled / closed out)

→ Physical delivery
→ Fixed payment
→ Floating payment

CS: Hedge of crack spread using futures contracts (III)

Reasoning – application of hedge accounting

- Accounting treatment without application of hedge accounting:
  - The **futures position** meets the IFRS criteria for derivatives (IAS 39.9)
    - ►Fair value changes are recognized directly in PnL
  - The **physical purchase and sales transactions** are considered as forecast transactions
    - ►No recognition in balance sheet or PnL*
- Consequence: non-economic PnL fluctuations due to accounting mismatch
- Application of (cash flow) hedge accounting leads to the recognition of fair value changes in equity (OCI)

*Due to the floating price basis, the contracts are unlikely to become onerous (IAS 37.66).

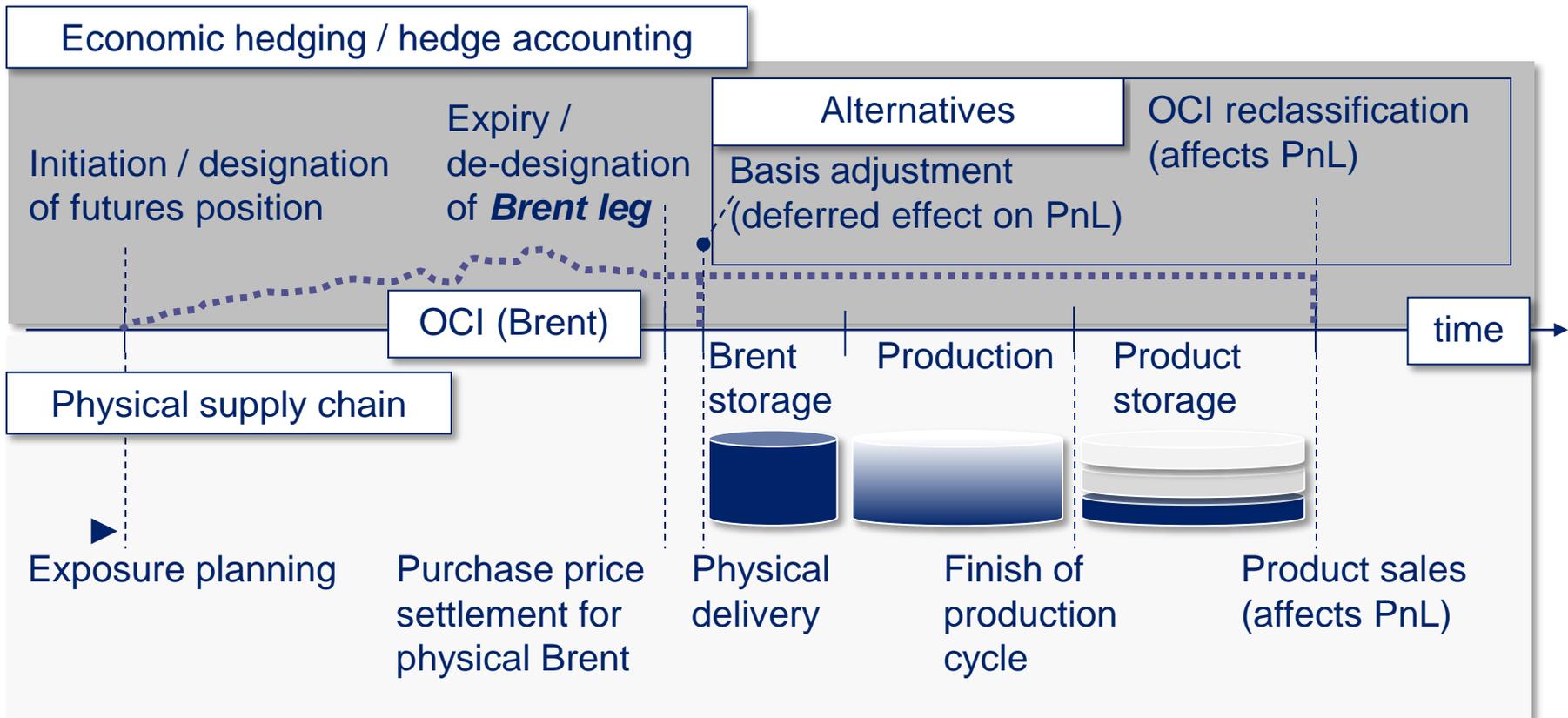# CS: Hedge of crack spread using futures contracts (IV)

Hedge accounting setup

- ***Hedged items (forecast transactions):***
  - The future purchase of Brent on a floating price basis
  - The future sales of gasoil on a floating price basis
- ***Hedging instrument:*** The long futures position offsetting the risk of crack spread changes
- ***Hedge life-cycle:***
  - Upon initial recognition of the hedging instrument, the Brent leg* (gasoil leg) of the futures position is designated to the forecast Brent purchase (gasoil sales)
  - Hedge effectiveness has to be demonstrated separately for both legs
  - Each one of the two hedging relationships for the Brent and gasoil legs is de-designated separately upon expiry of the underlying futures leg

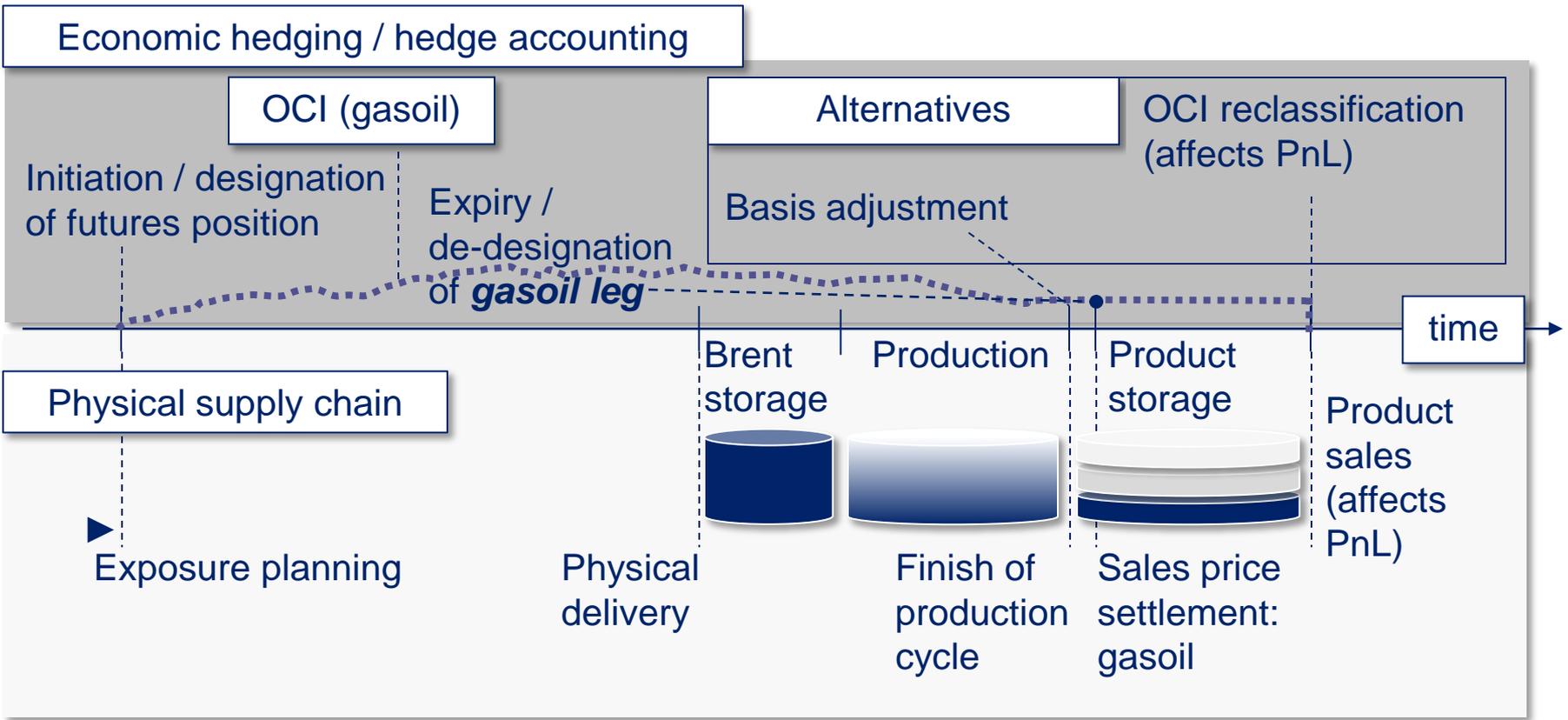*The futures position has to be designated in its entirety (IAS 39.74).

CS: Hedge of crack spread using futures contracts (V)

Hedge accounting and related processes: *Brent leg*

Economic hedging / hedge accounting

Initiation / designation
of futures position

Expiry /
de-designation
of *Brent leg*

Alternatives

Basis adjustment
(deferred effect on PnL)

OCI reclassification
(affects PnL)

OCI (Brent)

Brent
storage

Production

Product
storage

time

Physical supply chain

▶ Exposure planning

Purchase price
settlement for
physical Brent

Physical
delivery

Finish of
production
cycle

Product sales
(affects PnL)

CS: Hedge of crack spread using futures contracts (VI)

Hedge accounting and related processes: *gasoil leg*

Economic hedging / hedge accounting

OCI (gasoil)

Alternatives

OCI reclassification (affects PnL)

Initiation / designation of futures position

Expiry / de-designation of *gasoil leg*

Basis adjustment

time

Brent storage

Production

Product storage

Physical supply chain

Product sales (affects PnL)

▶

Exposure planning

Physical delivery

Finish of production cycle

Sales price settlement: gasoil

Agenda

- Price risk exposure for physical commodities

- Economic hedging along the industrial supply chain

- Accounting treatment of economic hedging schemes (IFRS)

- Commodity hedge accounting framework (IFRS)

- Case study – commodity hedging and hedge accounting

- Summary

Summary

- Large historic price volatility for commodities leads to fluctuating earnings and cash flows for industrial companies and energy firms

- Economic hedging of energy and commodity inventories, firm commitments and forecast transactions using derivatives can be applied to control and stabilize earnings and cash flows

- Due to the requirement to measure derivatives at their fair values (IFRS), economic hedging tends to increase the volatility of the (unrealized) PnL

- Hedge accounting (IFRS) provides a means to transfer the economic hedging effect to the PnL statement, but comes at the cost of increased process complexity and effort