The Use of Accounting Information to Estimate Indicators of Customer and Supplier Payment Periods
OUTLINE

1. Introduction and motivation
2. Data sources and methodology
3. Empirical results
4. Conclusions
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1. Introduction and motivation
2. Data sources and methodology
3. Empirical results
4. Conclusions
1. Introduction and motivation (I)

- Trade credits play a major role in the financing of European companies; on average the outstanding amount of this type of financing is close to 30% of GDP

![Trade credits in Euro area chart](chart.png)

However, trade credits often played only a secondary role in financial statement analysis and the statistical information system in the past.

This study aims to offer an insight into the importance of trade credits in the member countries of the ECCBSO Financial Statements Analysis Working Group, i.e. Belgium, Germany, Spain, France, Italy, Poland, Portugal and Turkey.
• Cash-flow disruptions induced by late payments are often signalled as a cause of bankruptcy, and the problem has become even more acute since the 2008-2009 financial crisis as financing conditions have been tightened
• “EU Late Payment Directive 2011/7/EU (adopted on 16 February 2011) to improve financing conditions”.
• Ex-post evaluation of the European Directive on late payments (2011): “There is little evidence that the Directive has had an impact on payment behaviour and on the practice of late payment”
  - Only some improvement has been observed in trade credit figures and some countries actually experienced an increase in payment delays

  - Furthermore, exercise of the rights conferred by the Directive is not widespread due to fear of damaging good business relationships

  - Rather than legislation, business culture, economic conditions and power imbalances in the market are the driving factors behind payment behaviour
1. Introduction and motivation (III)

- In order to analyse trade credits based on financial statements data, the ratios Days Sales Outstanding (DSO) and Days Payable Outstanding (DPO) are used.

- **Average** ratios are calculated, but the study aims also to inform on the **full distribution of values** in the national samples (medians, percentiles, KDE distributions).

- The study points out the **differences** in DSO and DPO **distributions**:  
  - *between countries*  
  - *between sectors and size-classes*  
  - *over time (trends in the aftermath of the 2008-2009 financial crisis)*

- It also focuses on other aspects, such as correlations, synthetic indicators and the link between DSO, DPO and financial distress.
OUTLINE

1. Introduction
2. Data sources and methodology
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2. Data Sources and Methodology (I)

• **Population:**
  - The study makes use of the large datasets from each national CBSO
  - Almost 100% of companies included in the samples of this study have a legal form of *corporation or cooperative*
  - Sole proprietorships are not included

• **Time horizon:**
  - From 2000 to 2013

• **Type of financial statements:**
  - *Individual financial statements*
  - Mostly national generally accepted accounting principles (GAAP). In some countries (such as PT and ES), the latest GAAP are very close to IFRS in recent years

• **Sectoral coverage:**
  - Manufacturing
  - Construction
  - Trade
2. Data Sources and Methodology (II)

• Size classes:

  - This report follows the EU Commission Recommendation concerning the definition of **micro, small, medium-sized and large enterprises**, by using the **turnover criterion**

  - **The thresholds** used for defining micro, small, medium-sized and large corporations are €2 million, €10 million and €50 million of turnover, respectively…

  - …deflated using the **Harmonised Index of Consumer Prices (HICP) of the Euro area**. Year 2010 was selected as the base year for calculations

  - **For Poland and Turkey**, the threshold values were converted into the national currencies by using each country’s real effective exchange rate versus the euro area-18 trading partners (REER)

  - **Micro-corporations** (i.e. firms with turnover < €2 million) have been excluded from the analysis, because these firms (i) are not directly comparable across countries, due to different data collection methods; and (ii) suffer from outliers and volatility in the ratios
2. Data Sources and Methodology (III)

- Deflated cut-off points for turnover and exchange rates

![Graphs showing data for Euro Area countries, Poland, and Turkey.](image-url)
2. Data Sources and Methodology (IV)

- **Two classical ratios** offer an indication of the liquidity of trade debts and receivables

- FSA WG decided on a **net approach** (net amount of money exchanged with the clients/suppliers of the companies by **prepayments**)

**Days Sales Outstanding (DSO)** is the average number of days the customer trade receivable is “on the books”

<table>
<thead>
<tr>
<th>Numerator</th>
<th>360 \times (\text{Trade receivables } – \text{customer prepayments})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denominator</td>
<td>Net turnover</td>
</tr>
</tbody>
</table>

*Interpretation: The lower DSO, the sooner the firm tends to be paid by its customers*

**Days Payable Outstanding (DPO)** is the average number of days a company takes before paying its suppliers

<table>
<thead>
<tr>
<th>Numerator</th>
<th>360 \times (\text{Trade payables } – \text{Advances to suppliers})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denominator</td>
<td>Purchases</td>
</tr>
</tbody>
</table>

*Interpretation: The lower the DPO, the faster a company pays its trade credit*
2. Data Sources and Methodology (V)

- **Rejection of outliers:**
  Exclusion of extreme microdata (“outliers”) with **Box-Plot method, for each sector/size/year combination**

  Method based on the interquartile range (Q3-Q1), with a multiplier k (k=6 is used in order to exclude only very extreme outliers):

  Algebraically:

  
  \[
  [Q_1 - k(Q_3 - Q_1), Q_3 + k(Q_3 - Q_1)]
  \]

  Graphically:

  ![Graph showing outlier exclusion](image)

- **NB:** There is a variety of possible treatments for outliers (e.g. use of standard deviation instead of interquartile range, 1%-99% cut-offs, winsorisation, etc.)
2. Data Sources and Methodology (VI)

• This chosen approach in DSO and DPO definitions, traditional in financial statement analysis, may result in some bias due to the inconsistency between the numerator and the denominator in relation to indirect taxes.
• While turnover and purchases do not include indirect taxes, the balance sheet trade credit items (receivables and payables accounts) do include them.
• => What is the impact of VAT on DSO and DPO in the context of an international and an over-time comparison?

STANDARD VAT RATES APPLIED BY COUNTRIES

[Graph showing standard VAT rates applied by countries with percentages and years indicated]
2. Data Sources and methodology (VII)

- The information on indirect taxes for Portugal and Spain is used to measure the magnitude of the bias in DSO and DPO measurement:
  - The VAT correction to the median of the DSO indicator for Portugal was 8 days, while it was slightly lower in Spain (7 days)
  - With regard to the median DPO, the VAT corrections reduced the payment periods by 7 days in Portugal and by 5 in Spain

The problem of lack of consistency between the numerator and denominator may not be relevant if the VAT rates hold stable over time.

However, if these modifications in tax rates levels occurred, some breaks in the evolutions of DSO and DPO would arise.
2. Data Sources and methodology (VIII)

- National datasets - breakdown by size

### Number of companies, 2013

All sectors, by size

<table>
<thead>
<tr>
<th>Units</th>
<th>Belgium</th>
<th>Germany</th>
<th>Spain</th>
<th>France</th>
<th>Italy</th>
<th>Poland</th>
<th>Portugal</th>
<th>Turkey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>3.308</td>
<td>13.632</td>
<td>17.865</td>
<td>52.144</td>
<td>38.396</td>
<td>7.930</td>
<td>8.088</td>
<td>2.365</td>
</tr>
<tr>
<td>Large</td>
<td>1.370</td>
<td>4.659</td>
<td>713</td>
<td>4.555</td>
<td>3.721</td>
<td>1.316</td>
<td>420</td>
<td>966</td>
</tr>
<tr>
<td>p.m. Micro</td>
<td>1.976</td>
<td>12.886</td>
<td>174.937</td>
<td>64.897</td>
<td>13.665</td>
<td>7.574</td>
<td>123.194</td>
<td>727</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% of the total</th>
<th>Belgium</th>
<th>Germany</th>
<th>Spain</th>
<th>France</th>
<th>Italy</th>
<th>Poland</th>
<th>Portugal</th>
<th>Turkey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>38,7</td>
<td>48,3</td>
<td>82,2</td>
<td>71,6</td>
<td>67,7</td>
<td>61,6</td>
<td>77,8</td>
<td>41,6</td>
</tr>
<tr>
<td>Medium-sized</td>
<td>45,2</td>
<td>35,2</td>
<td>14,6</td>
<td>22,1</td>
<td>25,8</td>
<td>28,2</td>
<td>18,2</td>
<td>41,3</td>
</tr>
<tr>
<td>Large</td>
<td>16,0</td>
<td>16,5</td>
<td>3,3</td>
<td>6,3</td>
<td>6,6</td>
<td>10,2</td>
<td>4,0</td>
<td>17,0</td>
</tr>
<tr>
<td>Total</td>
<td>100,0</td>
<td>100,0</td>
<td>100,0</td>
<td>100,0</td>
<td>100,0</td>
<td>100,0</td>
<td>100,0</td>
<td>100,0</td>
</tr>
</tbody>
</table>
1. Introduction

2. Data sources and methodology

3. Empirical results

4. Conclusions
Weighted means, DSO

- There are considerable differences in DSO figures from one country to another relating, inter alia, to:
  - payment culture
  - legal environment
  - corporation structure
  - trade policy
  - bargaining power, etc.
- The larger the firm, the lower the DSO
Weighted means, DPO

DPO (weighted means, 2013)
Weighted means. Trade credit periods balance
Weighted means, DSO and breakdown by sector

**DSO in manufacturing (weighted means, 2013)**

- Belgium: Small - 48, Medium-sized - 21, Large - 51
- Germany: Small - 51, Medium-sized - 49, Large - 90
- Spain: Small - 83, Medium-sized - 64, Large - 67
- France: Small - 61, Medium-sized - 61
- Italy: Small - 60, Medium-sized - 50, Large - 47
- Poland: Small - 50, Medium-sized - 47
- Portugal: Small - 47
- Turkey: Small - 47

**DSO in construction (weighted means, 2013)**

- Belgium: Small - 86, Medium-sized - 85, Large - 100
- Germany: Small - 100, Medium-sized - 82, Large - 102
- Spain: Small - 102, Medium-sized - 102, Large - 102
- France: Small - 50, Medium-sized - 50, Large - 50
- Italy: Small - 50, Medium-sized - 50
- Poland: Small - 50, Medium-sized - 50
- Portugal: Small - 50, Medium-sized - 50
- Turkey: Small - 50

**DSO in trade (weighted means, 2013)**

- Belgium: Small - 113, Medium-sized - 71, Large - 40
- Germany: Small - 40, Medium-sized - 55, Large - 66
- Spain: Small - 66, Medium-sized - 55, Large - 40
- France: Small - 40, Medium-sized - 55, Large - 66
- Italy: Small - 66, Medium-sized - 55
- Poland: Small - 55, Medium-sized - 40
- Portugal: Small - 40, Medium-sized - 55
- Turkey: Small - 55

**DSO in retail trade (weighted means, 2013)**

- Belgium: Small - 38, Medium-sized - 9, Large - 14
- Germany: Small - 9, Medium-sized - 6, Large - 14
- Spain: Small - 14, Medium-sized - 6
- France: Small - 6, Medium-sized - 14
- Italy: Small - 14, Medium-sized - 6
- Poland: Small - 6, Medium-sized - 14
- Portugal: Small - 14, Medium-sized - 6
- Turkey: Small - 6

Financial Statement Analysis Working Group
Weighted means, DPO and breakdown by sector

DPO in manufacturing (weighted means, 2013)

DPO in construction (weighted means, 2013)

DPO in trade (weighted means, 2013)

DPO in retail trade (weighted means, 2013)
Kolmogorov-Smirnov test

As a complement to the analysis of the differences between countries based on weighted means, the distance of the DSO and DPO estimated distribution function of each national sample versus the other countries has been worked out using the calculations of the Kolmogorov-Smirnov statistics (KS)

The KS statistics of all countries calculated against the German samples show a positive correlation between this measure of divergence and weighted means

These results would suggest the robustness of the weighted means for identifying the aggregated behaviour of firms by country and to determine their relative position
For both weighted means and median values, DSO and DPO are *positively and closely linked* (>0.90): the higher the DSO, the higher the DPO, and vice versa.
Correlations at firm level

Correlation coefficients remain positive but are markedly lower (between 0.20 and 0.40 in most cases)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Size</th>
<th>Belgium</th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
<th>Poland</th>
<th>Portugal</th>
<th>Spain</th>
<th>Turkey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>1 Micro</td>
<td>0.28</td>
<td>0.30</td>
<td>0.23</td>
<td>0.33</td>
<td>0.30</td>
<td>0.32</td>
<td>0.83</td>
<td>0.07(a)</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>2 Small</td>
<td>0.31</td>
<td>0.33</td>
<td>0.19</td>
<td>0.31</td>
<td>0.30</td>
<td>0.29</td>
<td>0.28</td>
<td>0.15</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>3 Medium</td>
<td>0.27</td>
<td>0.34</td>
<td>0.14</td>
<td>0.32</td>
<td>0.34</td>
<td>0.29</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>4 Large</td>
<td>0.35</td>
<td>0.26</td>
<td>0.07</td>
<td>0.33</td>
<td>0.24</td>
<td>0.26</td>
<td>0.15</td>
<td>0.20</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Total w/o Micro</td>
<td>0.30</td>
<td>0.33</td>
<td>0.16</td>
<td>0.33</td>
<td>0.30</td>
<td>0.31</td>
<td>0.21</td>
<td>0.17</td>
</tr>
<tr>
<td>Construction</td>
<td>1 Micro</td>
<td>0.14</td>
<td>0.40</td>
<td>0.26</td>
<td>0.26</td>
<td>0.41</td>
<td>0.30</td>
<td>0.00(a)</td>
<td>-0.12(a)</td>
</tr>
<tr>
<td>Construction</td>
<td>2 Small</td>
<td>0.26</td>
<td>0.39</td>
<td>0.27</td>
<td>0.42</td>
<td>0.39</td>
<td>0.30</td>
<td>0.10</td>
<td>0.20</td>
</tr>
<tr>
<td>Construction</td>
<td>3 Medium</td>
<td>0.33</td>
<td>0.37</td>
<td>0.22</td>
<td>0.41</td>
<td>0.35</td>
<td>0.53</td>
<td>0.66</td>
<td>0.12(a)</td>
</tr>
<tr>
<td>Construction</td>
<td>4 Large</td>
<td>0.27</td>
<td>0.31</td>
<td>0.11(a)</td>
<td>0.42</td>
<td>0.56</td>
<td>0.69</td>
<td>-0.08(a)</td>
<td>0.13(a)</td>
</tr>
<tr>
<td>Construction</td>
<td>Total w/o Micro</td>
<td>0.30</td>
<td>0.38</td>
<td>0.25</td>
<td>0.43</td>
<td>0.38</td>
<td>0.34</td>
<td>0.12</td>
<td>0.18</td>
</tr>
<tr>
<td>Trade</td>
<td>1 Micro</td>
<td>0.14</td>
<td>0.37</td>
<td>0.28</td>
<td>0.25</td>
<td>0.24</td>
<td>0.25</td>
<td>0.01</td>
<td>0.06(a)</td>
</tr>
<tr>
<td>Trade</td>
<td>2 Small</td>
<td>0.36</td>
<td>0.45</td>
<td>0.29</td>
<td>0.45</td>
<td>0.34</td>
<td>0.45</td>
<td>0.38</td>
<td>0.20</td>
</tr>
<tr>
<td>Trade</td>
<td>3 Medium</td>
<td>0.37</td>
<td>0.48</td>
<td>0.10</td>
<td>0.40</td>
<td>0.40</td>
<td>0.43</td>
<td>0.50</td>
<td>0.36</td>
</tr>
<tr>
<td>Trade</td>
<td>4 Large</td>
<td>0.42</td>
<td>0.39</td>
<td>0.04</td>
<td>0.31</td>
<td>0.41</td>
<td>0.20</td>
<td>0.88</td>
<td>0.21</td>
</tr>
<tr>
<td>Trade</td>
<td>Total w/o Micro</td>
<td>0.37</td>
<td>0.45</td>
<td>0.20</td>
<td>0.43</td>
<td>0.35</td>
<td>0.45</td>
<td>0.44</td>
<td>0.27</td>
</tr>
</tbody>
</table>

(1) Correlation coefficients relate to year 2013.
(Δ) Correlation coefficients are not significantly different from 0 at the 95% threshold.
Synthetic indicators – FSA weighted averages

With the aim of summarising the national information in synthetic indicators, FSA aggregates for DSO and DPO have been constructed as averages of the eight countries of the FSA WG, weighted by the value added of each economy’s non-financial corporations (constant weights).

The DSO and DPO synthetic indicators show a clearly downward trend between 2000 and 2013 (with a break in 2008-2009 due to the economic downturn), with the lowest levels being reached in the last year. It reflects mainly the reduction of payment periods in a small number of (big) countries.
Synthetic indicators - Cross-country variations

To measure the **dispersion** of DSO and DPO of the individual countries around the FSA averages, **coefficients of variation were calculated too**

These weighted cross-country **coefficients of variation** are calculated as the weighted (by the respective value added of non-financial corporations) **standard deviation** of DSO/DPO across countries divided by the FSA synthetic indicator.

After 2007, a trend has been observed towards an **increase in the heterogeneity in the national behaviour** of customer--collection and supplier-payment periods, **due to probable substantial differences in the macroeconomic consequences of the crisis**.
KDE in a nutshell

The KDE method allows a distribution function to be estimated that is not dependent on the width of the bins used to construct a histogram. It smooths out the contribution of each observed data point around its local vicinity.

Parameters can be used to adjust the smoothing level of the KDE distribution. In this analysis, we used the default parameters proposed by statistical software in use.

We used the KDE method to compare graphically the distribution functions of different groups of firms (country/sectors/years).
KDE distributions, by country

DSO 2013, All sectors
KDE distributions, by country

DPO 2013, All sectors

- Belgium
- Germany
- Spain
- France
- Italy
- Poland
- Portugal
- Turkey
Cumulated KDE distributions, by country

DSO 2013, All sectors, cumulative

- DSO = 30 days
- = 60 days
Cumulated KDE distributions, by country

DPO 2013, All sectors, cumulative

DPO = 30 days
= 60 days

Legend:
- Belgium
- Germany
- Spain
- France
- Italy
- Poland
- Portugal
- Turkey
KDE distributions, by country and sector

DSO 2013, Manufacturing

DSO 2013, Construction

DSO 2013, Trade

DSO 2013, Retail trade
KDE distributions, by country and sector
Extreme values in DSO and DPO ratios: the Turkish case

Outlier Analysis for KDE Estimates: Some factors for the densities beyond -100 and 500, by sector:

**CONSTRUCTION**
- Contracting companies
- Completion method for accounting
- Interim payment problems
- Lump-sum accounting records for separate projects

**MANUFACTURING**
- Long-term manufacturing
- International contracts-exchange rate risk
- Sub-group companies-access to finance problem

**TRADE**
- Long-term energy investments
- Long-term contracts covering machine trade
- Working with dealers
KDE distributions over time: FRANCE

In France, DSO and DPO have markedly shortened because of the introduction of the LME (Loi de modernisation de l’économie).
In Turkey, DSO and DPO distributions became flatter. Payment periods grew markedly longer at the right tail of the distribution.
KDE distributions over time: BELGIUM

In Belgium, the differences over time are small. We can only observe a slight change in the KDE distributions to the left, indicating a shortening of the payment periods.

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2013</th>
<th>Δ 2007-2013</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DSO</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P25</td>
<td>33</td>
<td>27</td>
<td>-6</td>
</tr>
<tr>
<td>P50</td>
<td>58</td>
<td>52</td>
<td>-6</td>
</tr>
<tr>
<td>P75</td>
<td>84</td>
<td>78</td>
<td>-6</td>
</tr>
<tr>
<td><strong>DPO</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P25</td>
<td>36</td>
<td>31</td>
<td>-5</td>
</tr>
<tr>
<td>P50</td>
<td>59</td>
<td>53</td>
<td>-6</td>
</tr>
<tr>
<td>P75</td>
<td>89</td>
<td>82</td>
<td>-7</td>
</tr>
</tbody>
</table>
Differences over time: are they significant?

(ii) using the chi-square test of homogeneity in order to determine whether these distributions are similar or different according to the year

Chi-square test: DSO over time

<table>
<thead>
<tr>
<th>Observed data</th>
<th>Country: FR</th>
<th>Size: Total w/o Micro</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSO &lt; 0</td>
<td>1424</td>
<td>74424</td>
</tr>
<tr>
<td>0 &lt;= DSO &lt; 30</td>
<td>24471</td>
<td>72824</td>
</tr>
<tr>
<td>30 &lt;= DSO &lt; 60</td>
<td>19292</td>
<td>74424</td>
</tr>
<tr>
<td>60 &lt;= DSO &lt; 90</td>
<td>71284</td>
<td>72824</td>
</tr>
<tr>
<td>90 &lt;= DSO &lt; 120</td>
<td>7110</td>
<td>74424</td>
</tr>
<tr>
<td>DSO &gt;= 120</td>
<td>4424</td>
<td>72824</td>
</tr>
</tbody>
</table>

Expected frequency

<table>
<thead>
<tr>
<th>Expected frequency</th>
<th>DSO &lt; 0</th>
<th>0 &lt;= DSO &lt; 30</th>
<th>30 &lt;= DSO &lt; 60</th>
<th>60 &lt;= DSO &lt; 90</th>
<th>90 &lt;= DSO &lt; 120</th>
<th>DSO &gt;= 120</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR 2012</td>
<td>1777</td>
<td>24649</td>
<td>19123</td>
<td>17202</td>
<td>7196</td>
<td>4423</td>
</tr>
<tr>
<td>FR 2013</td>
<td>1738</td>
<td>24120</td>
<td>18716</td>
<td>16832</td>
<td>7041</td>
<td>4376</td>
</tr>
</tbody>
</table>

Calculations

<table>
<thead>
<tr>
<th>Calculations</th>
<th>2.41</th>
<th>1.29</th>
<th>1.43</th>
<th>0.39</th>
<th>1.02</th>
<th>0.53</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14.30</td>
</tr>
</tbody>
</table>

Null hypothesis: The DSO distributions for Total sector and all sizes (FR) in 2012 and 2013 are similar.

The test compares whether frequency counts are distributed identically across different samples (2012 and 2013).

The example of resolution of the chi-square test for the DSO ratio for the French samples. If the significance level is 5%, then we would conclude that there is a statistically significant difference in the proportion of firms in the six categories of DSO between 2012 and 2013.
Bivariate KDE – Large firms – Industry

- Belgium

- Spain
Bivariate KDE – Large firms – Construction

- Belgium

- Spain
Bivariate KDE – Large firms – Retail trade

- Belgium

- Spain
OUTLINE

1. Introduction
2. Data sources and methodology
3. Empirical results
4. Conclusions
4. Conclusions

- The study examines the importance of trade credits in the FSA WG countries.
- The collection and payment periods of trade credit, obtained from accounting data, are assessed by means of two key financial ratios:
  - Days Sales Outstanding (DSO)
  - Days Payables Outstanding (DPO)
- The results reveal differences in DSO and DPO across countries, sectors and sizes.
- Future plan: To set up this study on DSO and DPO as a permanent ECCBSO database of collection and payment periods.
  - Weighted average
  - KDE
  - Statistics test of homogeneity (by year, by country, etc.)
THANK YOU FOR YOUR ATTENTION.
ANY QUESTIONS?