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6 Werte für Payback-Verfahren

a) Problemlage:

Welche Rentabilität (= Zinsfuss von p [%]) ergibt ein Kapitaleinsatz C, der durchschnittliche Nettoeinnahmen pro Zeiteinheit (zum Beispiel jährlich) E zur Folge hat?

Bezeichnungen:

C = Kapitaleinsatz am Anfang (investment outlay)
E = Durchschnittliche Nettoeinnahme (average cash earnings)
n = Nutzungsdauer
p = Zinsfuss (Rentabilität) in Prozent
P = Kapitalwiedergewinnungszeit (payback period)
k = Zahl der Kapitalrückflüsse

Gegeben: C, E, n

Gesucht: P → p %; (k)

b) Lösung des Problems: Arbeitsablauf

1. **Berechnung der Kapitalwiedergewinnungszeit z:**
   Nach Shillinglaw* ist:

   $$\text{Payback period (years)} = \frac{\text{Investment outlay}}{\text{Average cash earnings per year}}$$

   das heisst also:

   $$P = \frac{C}{E}\ ;\ \left\{ = \frac{(1+i)^n - 1}{i\,(1+i)^n} \right\} \qquad (10)$$

2. **Konsultation der Tabelle 6:**
   n → P-Wert → p %

3. **Berechnung der Zahl der Kapitalrückflüsse k:**
   (Indiz für Höhe der Rentabilität)

   $$k = \frac{n}{P}\ ;\ \left\{ = \frac{E}{C}\ n \right\} \qquad (11)$$

c) Beispiel:

C = Fr. 50 000; n = 10 Jahre
E = Fr. 10 000

Kapitalwiedergewinnungszeit P:

$$P = \frac{C}{E} = \frac{50\,000}{10\,000} = \mathbf{5{,}000}$$

Zahl der Kapitalrückflüsse k:

$$k = \frac{n}{P} = \frac{10}{5{,}0} = 2{,}0$$

Tabelle 6 für **n = 10** und **z = 5,000**

p = 15% : P = 5,019
p = 16% : P = 4,833

Gesuchte Rentabilität p: rund 15%
(vgl. dazu **Käfer, K:** Investitionsrechnungen, 1964, S. 17 ff.).

Im Gegensatz zu Käfer (Tabelle S. 20) benötigen wir die Zahl der Kapitalrückflüsse zur Bestimmung der Rentabilität nicht. Aus Nutzungsdauer n und Payback period P kann p (%) direkt aus unserer Tabelle 6 abgelesen werden.

* **G. Shillinglaw:** Cost accounting: Analysis and Control, 1961.

Tabelle 6 : $P = \frac{C}{E} = \frac{(1+i)^n - 1}{i\,(1+i)^n}$

p (%)	n = 5	n = 6	n = 7	n = 8	n = 9	n = 10	n = 11	n = 12	p (%)
3	4,580	5,417	6,230	7,020	7,786	8,530	9,253	9,954	3
3¼	4,547	5,373	6,172	6,946	7,696	8,422	9,126	9,807	3¼
3½	4,515	5,329	6,115	6,874	7,608	8,317	9,002	9,663	3½
3¾	4,483	5,285	6,058	6,803	7,521	8,213	8,880	9,523	3¾
4	4,452	5,242	6,002	6,733	7,435	8,111	8,760	9,385	4
4¼	4,421	5,200	5,947	6,664	7,351	8,011	8,644	9,250	4¼
4½	4,390	5,158	5,893	6,596	7,269	7,913	8,529	9,119	4½
4¾	4,360	5,117	5,839	6,529	7,188	7,816	8,417	8,990	4¾
5	4,329	5,076	5,786	6,463	7,108	7,722	8,306	8,863	5
5½	4,270	4,996	5,683	6,335	6,952	7,538	8,093	8,619	5½
6	4,212	4,917	5,582	6,210	6,802	7,360	7,887	8,384	6
6½	4,156	4,841	5,485	6,089	6,656	7,189	7,689	8,159	6½
7	4,100	4,767	5,389	5,971	6,515	7,024	7,499	7,943	7
8	3,993	4,623	5,206	5,747	6,247	6,710	7,139	7,536	8
9	3,890	4,486	5,033	5,535	5,995	6,418	6,805	7,161	9
10	3,791	4,355	4,868	5,335	5,759	6,145	6,495	6,814	10
11	3,696	4,231	4,712	5,146	5,537	5,889	6,207	6,492	11
12	3,605	4,111	4,564	4,968	5,328	5,650	5,938	6,194	12
13	3,517	3,998	4,423	4,799	5,132	5,426	5,687	5,918	13
14	3,433	3,889	4,288	4,639	4,946	5,216	5,453	5,660	14
15	3,352	3,784	4,160	4,487	4,772	5,019	5,234	5,421	15
16	3,274	3,685	4,039	4,344	4,607	4,833	5,029	5,197	16
17	3,199	3,589	3,922	4,207	4,451	4,659	4,836	4,988	17
18	3,127	3,498	3,812	4,078	4,303	4,494	4,656	4,793	18
19	3,058	3,410	3,706	3,954	4,163	4,339	4,486	4,611	19
20	2,991	3,326	3,605	3,837	4,031	4,192	4,327	4,439	20
21	2,926	3,245	3,508	3,726	3,905	4,054	4,177	4,278	21
22	2,864	3,167	3,416	3,619	3,786	3,923	4,035	4,127	22
23	2,803	3,092	3,327	3,518	3,673	3,799	3,902	3,985	23
24	2,745	3,020	3,242	3,421	3,566	3,682	3,776	3,851	24
25	2,689	2,951	3,161	3,329	3,463	3,571	3,656	3,725	25
26	2,635	2,885	3,083	3,241	3,366	3,465	3,543	3,606	26
27	2,583	2,821	3,009	3,156	3,273	3,364	3,437	3,493	27
28	2,532	2,759	2,937	3,076	3,184	3,269	3,335	3,387	28
29	2,483	2,700	2,868	2,999	3,100	3,178	3,239	3,286	29
30	2,436	2,643	2,802	2,925	3,019	3,092	3,147	3,190	30
31	2,390	2,588	2,739	2,854	2,942	3,009	3,060	3,100	31
32	2,345	2,534	2,677	2,786	2,868	2,930	2,978	3,013	32
33	2,302	2,483	2,619	2,721	2,798	2,855	2,899	2,931	33
34	2,260	2,433	2,562	2,658	2,730	2,784	2,824	2,853	34

Tabelle 6 : $P = \frac{C}{E} = \frac{(1+i)^n - 1}{i\,(1+i)^n}$

p (%)	n = 5	n = 6	n = 7	n = 8	n = 9	n = 10	n = 11	n = 12	p (%)
35	2,220	2,385	2,508	2,598	2,665	2,715	2,752	2,779	35
36	2,181	2,339	2,455	2,540	2,603	2,649	2,683	2,708	36
37	2,143	2,294	2,404	2,485	2,544	2,587	2,618	2,641	37
38	2,106	2,251	2,355	2,432	2,487	2,527	2,555	2,576	38
39	2,070	2,209	2,308	2,380	2,432	2,469	2,496	2,515	39
40	2,035	2,168	2,263	2,331	2,379	2,414	2,438	2,456	40
41	2,001	2,129	2,219	2,283	2,328	2,360	2,383	2,400	41
42	1,969	2,091	2,176	2,237	2,280	2,310	2,331	2,346	42
43	1,937	2,054	2,135	2,193	2,233	2,261	2,280	2,294	43
44	1,906	2,018	2,096	2,150	2,187	2,213	2,232	2,244	44
45	1,876	1,983	2,057	2,109	2,144	2,168	2,185	2,196	45
46	1,846	1,949	2,020	2,069	2,102	2,125	2,140	2,151	46
47	1,818	1,917	1,984	2,030	2,061	2,083	2,097	2,107	47
48	1,790	1,885	1,949	1,993	2,022	2,042	2,055	2,064	48
49	1,763	1,854	1,916	1,957	1,984	2,003	2,015	2,024	49
50	1,737	1,824	1,883	1,922	1,948	1,965	1,977	1,985	50
51	1,711	1,795	1,851	1,888	1,913	1,929	1,940	1,947	51
52	1,686	1,767	1,820	1,856	1,879	1,894	1,904	1,910	52
53	1,662	1,740	1,791	1,824	1,846	1,860	1,869	1,875	53
54	1,638	1,713	1,762	1,793	1,814	1,827	1,836	1,841	54
55	1,615	1,687	1,734	1,764	1,783	1,795	1,804	1,809	55
56	1,592	1,662	1,706	1,735	1,753	1,765	1,772	1,777	56
57	1,570	1,637	1,680	1,707	1,724	1,735	1,742	1,747	57
58	1,549	1,613	1,654	1,680	1,696	1,706	1,713	1,717	58
59	1,528	1,590	1,629	1,653	1,669	1,679	1,685	1,688	59
60	1,508	1,567	1,605	1,628	1,642	1,652	1,657	1,661	60
61	1,488	1,545	1,581	1,603	1,617	1,625	1,631	1,634	61
62	1,468	1,524	1,558	1,579	1,592	1,600	1,605	1,608	62
63	1,449	1,503	1,535	1,555	1,568	1,575	1,580	1,583	63
64	1,431	1,482	1,514	1,533	1,544	1,551	1,556	1,558	64
65	1,413	1,462	1,492	1,510	1,521	1,528	1,532	1,535	65
66	1,395	1,443	1,472	1,489	1,499	1,506	1,509	1,512	66
67	1,378	1,424	1,451	1,468	1,478	1,484	1,487	1,489	67
68	1,361	1,405	1,432	1,447	1,457	1,462	1,466	1,468	68
69	1,344	1,387	1,412	1,427	1,436	1,442	1,445	1,447	69
70	1,328	1,369	1,394	1,408	1,417	1,421	1,424	1,426	70
75	1,252	1,287	1,307	1,318	1,325	1,328	1,331	1,332	75
80	1,184	1,213	1,230	1,239	1,244	1,246	1,248	1,249	80

Tabelle 6 : $P = \frac{C}{E} = \frac{(1+i)^n - 1}{i\,(1+i)^n}$

p (%)	n = 13	n = 14	n = 15	n = 16	n = 17	n = 18	n = 19	n = 20	p (%)
3	10,635	11,296	11,938	12,561	13,166	13,754	14,324	14,877	3
3¼	10,467	11,106	11,725	12,324	12,905	13,467	14,012	14,539	3¼
3½	10,303	10,921	11,517	12,094	12,651	13,190	13,710	14,212	3½
3¾	10,142	10,740	11,315	11,870	12,405	12,920	13,417	13,896	3¾
4	9,986	10,563	11,118	11,652	12,166	12,659	13,134	13,590	4
4¼	9,833	10,391	10,927	11,440	11,933	12,406	12,859	13,294	4¼
4½	9,683	10,223	10,740	11,234	11,707	12,160	12,593	13,008	4½
4¾	9,537	10,059	10,557	11,033	11,488	11,921	12,335	12,731	4¾
5	9,394	9,899	10,380	10,838	11,274	11,690	12,085	12,462	5
5½	9,117	9,590	10,038	10,462	10,865	11,246	11,608	11,950	5½
6	8,853	9,295	9,712	10,106	10,477	10,828	11,158	11,470	6
6½	8,600	9,014	9,403	9,768	10,111	10,432	10,735	11,019	6½
7	8,358	8,745	9,108	9,447	9,763	10,059	10,336	10,594	7
8	7,904	8,244	8,559	8,851	9,122	9,372	9,604	9,818	8
9	7,487	7,786	8,061	8,313	8,544	8,756	8,950	9,129	9
10	7,103	7,367	7,606	7,824	8,022	8,201	8,365	8,514	10
11	6,750	6,982	7,191	7,379	7,549	7,702	7,839	7,963	11
12	6,424	6,628	6,811	6,974	7,120	7,250	7,366	7,469	12
13	6,122	6,302	6,462	6,604	6,729	6,840	6,938	7,025	13
14	5,842	6,002	6,142	6,265	6,373	6,467	6,550	6,623	14
15	5,583	5,724	5,847	5,954	6,047	6,128	6,198	6,259	15
16	5,342	5,468	5,575	5,668	5,749	5,818	5,877	5,929	16
17	5,118	5,229	5,324	5,405	5,475	5,534	5,584	5,628	17
18	4,910	5,008	5,092	5,162	5,222	5,273	5,316	5,353	18
19	4,715	4,802	4,876	4,938	4,990	5,033	5,070	5,101	19
20	4,533	4,611	4,675	4,730	4,775	4,812	4,843	4,870	20
21	4,362	4,432	4,489	4,536	4,576	4,608	4,635	4,657	21
22	4,203	4,265	4,315	4,357	4,391	4,419	4,442	4,460	22
23	4,053	4,108	4,153	4,189	4,219	4,243	4,263	4,279	23
24	3,912	3,962	4,001	4,033	4,059	4,080	4,097	4,110	24
25	3,780	3,824	3,859	3,887	3,910	3,928	3,942	3,954	25
26	3,656	3,695	3,726	3,751	3,771	3,786	3,799	3,808	26
27	3,538	3,573	3,601	3,623	3,640	3,654	3,664	3,673	27
28	3,427	3,459	3,483	3,503	3,518	3,529	3,539	3,546	28
29	2,322	3,351	3,373	3,390	3,403	3,413	3,421	3,427	29
30	3,223	3,249	3,268	3,283	3,295	3,304	3,311	3,316	30
31	3,129	3,152	3,170	3,183	3,193	3,201	3,207	3,211	31
32	3,040	3,061	3,076	3,088	3,097	3,104	3,109	3,113	32
33	2,956	2,974	2,988	2,999	3,007	3,012	3,017	3,020	33
34	2,876	2,892	2,905	2,914	2,921	2,926	2,930	2,933	34

Tabelle 6 : $P = \frac{C}{E} = \frac{(1+i)^n - 1}{i\,(1+i)^n}$

p (%)	n = 13	n = 14	n = 15	n = 16	n = 17	n = 18	n = 19	n = 20	p (%)
35	2,799	2,814	2,825	2,834	2,840	2,844	2,848	2,850	35
36	2,727	2,740	2,750	2,757	2,763	2,767	2,770	2,772	36
37	2,658	2,670	2,679	2,685	2,690	2,693	2,696	2,698	37
38	2,592	2,603	2,611	2,616	2,621	2,624	2,626	2,627	38
39	2,529	2,539	2,546	2,551	2,555	2,557	2,559	2,561	39
40	2,469	2,478	2,484	2,489	2,492	2,494	2,496	2,497	40
41	2,411	2,419	2,425	2,429	2,432	2,434	2,435	2,436	41
42	2,356	2,363	2,369	2,372	2,375	2,377	2,378	2,379	42
43	2,303	2,310	2,315	2,318	2,320	2,322	2,323	2,324	43
44	2,253	2,259	2,263	2,266	2,268	2,270	2,271	2,271	44
45	2,204	2,210	2,214	2,216	2,218	2,219	2,220	2,221	45
46	2,158	2,163	2,166	2,169	2,170	2,172	2,172	2,173	46
47	2,113	2,118	2,121	2,123	2,125	2,126	2,126	2,127	47
48	2,071	2,075	2,078	2,079	2,081	2,082	2,082	2,083	48
49	2,029	2,033	2,036	2,037	2,038	2,039	2,040	2,040	49
50	1,990	1,993	1,995	1,997	1,998	1,999	1,999	1,999	50
51	1,952	1,955	1,957	1,958	1,959	1,960	1,960	1,960	51
52	1,915	1,918	1,919	1,921	1,922	1,922	1,922	1,923	52
53	1,879	1,882	1,884	1,885	1,885	1,886	1,886	1,886	53
54	1,845	1,847	1,849	1,850	1,851	1,851	1,851	1,852	54
55	1,812	1,814	1,816	1,817	1,817	1,818	1,818	1,818	55
56	1,780	1,782	1,783	1,784	1,785	1,785	1,785	1,785	56
57	1,749	1,751	1,752	1,753	1,754	1,754	1,754	1,754	57
58	1,720	1,721	1,722	1,723	1,723	1,724	1,724	1,724	58
59	1,691	1,692	1,693	1,694	1,694	1,695	1,695	1,695	59
60	1,663	1,664	1,665	1,666	1,666	1,666	1,666	1,667	60
61	1,636	1,637	1,638	1,639	1,639	1,639	1,639	1,639	61
62	1,610	1,611	1,612	1,612	1,612	1,613	1,613	1,613	62
63	1,585	1,586	1,586	1,587	1,587	1,587	1,587	1,587	63
64	1,560	1,561	1,562	1,562	1,562	1,562	1,562	1,562	64
65	1,536	1,537	1,538	1,538	1,538	1,538	1,538	1,538	65
66	1,513	1,514	1,514	1,515	1,515	1,515	1,515	1,515	66
67	1,491	1,491	1,492	1,492	1,492	1,492	1,492	1,492	67
68	1,469	1,470	1,470	1,470	1,470	1,470	1,471	1,471	68
69	1,448	1,448	1,449	1,449	1,449	1,449	1,449	1,449	69
70	1,427	1,428	1,428	1,428	1,428	1,428	1,429	1,429	70
75	1,332	1,333	1,333	1,333	1,333	1,333	1,333	1,333	75
80	1,249	1,250	1,250	1,250	1,250	1,250	1,250	1,250	80